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ABSTRACT

Intended for professionals from a variety of disciplines (such as nutrition, dentistry, nursing, occupational and physical therapy, speech pathology, social work, and education), the guide presents information on feeding problems of children with handicaps. Part I, which traces the development of feeding, considers in detail normal development and deviations in the following areas: social and behavioral development, intellectual development, physical development, nutrition, reflex development, gross motor skills, fine motor skills, and oral motor skills. Part II describes approaches to assessment of social/behavioral, physical, nutritional, reflex and gross motor, fine motor, and oral motor development. The final part focuses on remediation of feeding problems, with comments about behavior problems, the effects of drugs on diet, nutrition and diet therapy, motor skills and reflex development (including the role of proper positioning), and oral motor skills. Sample case studies of children with hypertension/obesity, phenylketonuria, and physical disorders are presented to illustrate a team approach involving individual service plans and objectives. Appended are: a normal feeding development chart, the "Developmental Feeding Tool" (a checklist), a list of recommended types of food, a list of commercial dietary supplements, a chart of the effects of drugs on nutrition status, resources on referral agencies, and other resource lists. (CL)

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FEEDING MANAGEMENT OF A CHILD WITH A HANDICAP: A GUIDE FOR PROFESSIONALS ©

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FOREWORD

Handicapped children and their families require coordinated care by a team composed of a variety of disciplines often representing several agencies. Effective, efficient services for these children and their families require early identification and assessment by multiple disciplines, development of a plan for care, coordination of services among professionals in public, private and voluntary agencies and open and direct communication between family and care providers. This total care concept is essential to the provision of comprehensive services to children with special needs.

This *Feeding Management of a Child with a Handicap: A Guide for Professionals,* focuses on the total care concept and provides technical information on feeding the child with a handicap. It is intended for professionals in all disciplines who are involved in the care of handicapped children, including dentists, nurses, nutritionists, occupational therapists, physical therapists, physicians, psychologists, speech pathologists, social workers, and teachers. This book should be a useful reference for practicing professionals, particularly those who are planning and implementing feeding programs for handicapped children. It should assist faculty in a variety of disciplines in teaching students to work with handicapped children. This document could also serve as a resource for conducting continuing education programs and inservice training.

Many experienced professionals from all parts of the country contributed to this guidance material. It was prepared by a team of specialists at the Child Development Center, University of Tennessee, under the direction of Mary Ann Smith, Ph.D., Chief of Nutrition and Training Coordinator. Special appreciation is extended to that staff and to a number of others who took time to review and offer valuable comments, suggestions and revisions on the draft documents.

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PART I

Normal Development and some Deviations that Affect Feeding

INTRODUCTION

Feeding is one of the initial experiences of life. It is the process of nourishing the body by providing nutrients and energy for growth and health maintenance.

Through actions involved in the early feeding process, the infant begins to develop in many areas. Included are mother-infant bonding, development of the basic senses – touch, sight, smell, and taste – oral-motor development in the processes of sucking and swallowing, and socialization. Normal development in these areas frequently goes unnoticed or is taken for granted. Feeding problems are often recognized as early clues of something amiss. However, not all retarded children and not all children with physical handicaps have feeding difficulties. Of course, non-handicapped children may also have problems with feeding. When feeding problems are mismanaged or unrecognized, more severe difficulties may result. Thus, it is important for health professionals to understand normal development as well as deviations in feeding. The interdisciplinary team provides a key to feeding management of a child with a handicap since problems related to the feeding process span the scope of physiology, medicine, physical and occupational therapy, biochemistry, dentistry, speech pathology, nursing, psychology, nutrition, and other disciplines.

The purpose of this section is to review briefly normal infant development in areas pertinent to feeding – social and behavioral, intellectual, physical growth, nutrition, reflex, gross motor, fine motor, and oral-motor. The deviations in development in each area are discussed in relation to feeding.

SOCIAL AND BEHAVIORAL DEVELOPMENT

Normal Development

The family provides the framework for development of social skills and behavioral styles of the infant and child. Beginning with the very first contact by the mother, father, or caregiver, the groundwork is being laid for future social capabilities (O'Neil, McLaughlin & Knapp, 1977). Quality of the caregiver-infant interaction and early attachment is a determinant of social and behavioral development. Continuing positive and rewarding interaction helps to build the child's concept of self, social awareness, and self-confidence (Klaus & Kennell, 1976). Social stimulation (eye contact, smiling, fondling, and talking) is especially meaningful during the feeding experience. As the child progresses through stages of development, mealtime gradually expands to include other family members. Throughout life, food and mealtime continue as socializing experiences in which new tastes are explored, birthdays and other special occasions are celebrated, and love is expressed through special foods.

Play, which is a major vehicle for social and behavioral development, has been described as the "work" of children. Social interaction with games such as peek-a-boo and pat-a-cake characterize early infancy, while solitary play is typical of late infancy and early toddlerhood (Tudor, 1981). Parallel play is characteristic of the later toddler period. Cooperative and interactive play are normal activities for pre-school and school-age children, respectively. Appropriate toys help to promote social, behavioral, and motor progress – and thus feeding.

Behavior encompasses a wide range of normality. The behavior of the infant, child, and adolescent is predictable within certain limits and is influenced by many factors including significant persons, environment, health status, genetics, maturation, and learning. Behavior may be interpreted as positive or negative, appropriate or inappropriate. Exploring the environment, playing with toys, and following directions are examples of positive responses. Spitting out food, pulling hair, biting, and excessive crying are examples of negative behavior. Normal development, including both positive and negative behavior, is related to the stage and age of the child. Tantrums, refusal of food, and food jags are normal stages of behavioral development. The results of these behaviors largely determine whether the child will get through a stage of development and advance to the next successfully (Tudor, 1981). Infants and young children as well as school-age and adolescent groups need adult help and guidance in gaining control of their own behavior.

Deviations or Problems

When the social and behavioral development of the child fails to progress, problems occur. The major behavioral problems related to feeding in handicapped children are mealtime tantrums, bizarre food habits, poor food acceptance (including food rejection), prolonged dependency on pureed food, and general delay in acquiring self-feeding skills. Some of these problems result from mismanagement of behavior (Palmer & Ekvall, 1978).

Social maladaptation may be reflected in children's behavior in some of the following ways: immature responses, self-abusive behaviors, stereotypic movements, and hyperactive, aggressive, regressive, or withdrawn behavioral responses. Failure of the bonding process may contribute to these problems. Deviations in attachment as well as detachment can be related to the emergence of the above behaviors.

Many nutritional problems have social and behavioral origins. These include obesity, anorexia nervosa, pica, and rumination. Obesity is one of the most emotionally painful conditions that plagues adolescents. A much less prevalent problem is anorexia nervosa, which usually occurs in adolescent girls. The person becomes obsessed with self-denial of eating. Emaciation results, with near starvation in some instances. As many as 15-20% of those affected die. This serious disorder requires psychiatric treatment. Pica, the abnormal craving of non-edible substances, possibly is due to exaggerated mouthing behavior, a personality disturbance, or a serious emotional disorder. It is of great concern because it is often associated with lead intoxication. Though the etiology is not completely understood, rumination is another feeding problem viewed as psychological. It has been attributed to disturbed mother-child relationships. Severe, continuous rumination is associated with weight loss, malnutrition, and growth retardation (Palmer and Ekvall, 1978).

INTELLECTUAL DEVELOPMENT

Normal Development

Intellectual functioning is generally assessed by performance on intelligence or "IQ" tests. They are useful in making judgements about a child's level of functioning and in setting up programs to further develop his abilities. However, they are achievement tests showing what the child knows, but not how he knows it or what his thought processes are.

Perhaps the best and certainly the most widely-known attempt to answer these questions is Jean Piaget's theory of cognitive development (Piaget, 1968). Through painstaking observation and experimentation, beginning with his own children, this eminent Swiss psychologist tried to understand the mental processes and stages of development of the child from birth to maturity. His theory emphasizes adaptation and evolution of the behavior of the organism, in this case the human being.

Piaget saw knowledge not as something existing outside the developing child that is taken in, but as something created within the child by continual interaction with the environment. He believed that no one can remain mentally passive and be taught anything; all learning takes place in the context of active interchange with the environment. The environment, of course, includes other people.

Piaget described three broad stages of intellectual development. Every child who reaches cognitive maturity goes through them in the same order, regardless of the culture in which he lives. The ages vary at which different children attain major concepts, just as the ages vary at which children cut their first teeth, walk independently, and enter puberty.

Stage I: Sensorimotor Stage

The sensorimotor stage, from birth to about two years of age, is at first largely a neurological "tooling-up" period, although important concepts are formed even in the first few months. The infant begins to differentiate himself from the world around him and to differentiate and organize his body parts and their functions. Simple, isolated reflex actions are organized into complex responses to external or internal stimulation. For example, the reflexes "root," "suck," and "grasp," which are all present at birth, are organized into a response that might be called "feed." The concepts of "thing" and "object permanence" are gained in this stage; we are not born knowing that things exist independently of us or that a thing continues to exist even if it is covered or we look away from it. If such concepts were not acquired, the world would appear to be a totally confusing place with no stability whatsoever.

Stage II: Concrete Operations

This stage extends from about two through ten years of age. (Many Piagetian theorists divide this stage into preoperational and concrete operational periods, but this distinction is unnecessary for our discussion.) Concrete reasoning begins and develops. Flexibility of thought increases; before the age of six or seven most children are unable to see things, literally or figuratively, from another person's viewpoint. Language, which has its beginnings in the sensorimotor stage, plays a large part in the child's adaptation to the world. Symbols become important and thought can increasingly be substituted for action.

Stage III: Formal Operations

This is the final stage in the development of cognitive maturity. It extends from about eleven to sixteen or eighteen years of age. Using the foundation of knowledge and reasoning built during the first stages, the child can now form hypotheses about why things happen and test these hypotheses systematically. Abstract reasoning is developed. The end of adolescence marks the end of the period of rapid mental growth characteristic of childhood, but does not, of course, end learning. With luck and effort we can continue to mature intellectually throughout life.

From these examples it can be seen that a child's knowledge differs from an adult's qualitatively as well as quantitatively. An adult-level understanding of causality and logic is not possible in the early stages of development. The basis for this kind of understanding must be created during the childhood years. In adolescence it can be extended and refined.

Deviations or Problems

The major deviation from the course of development described above is mental retardation. The definition of retardation used by the American Association on Mental Deficiency is "significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior and manifested during the developmental period" (Grossman, 1973). From a Piagetian point of view, retardation in childhood can be seen as slower progress than normal in advancing through the stages of cognitive development. The retarded adult can be seen as "fixated" at a point normally reached before adolescence. For the severely or profoundly retarded adult, this point would be the sensorimotor stage. Moderately retarded and most mildly retarded adults reach their maximal growth in the stage of concrete operations. Some very mildly retarded adults end their cognitive development at the threshold of the stage of formal operations, but none have the capacity for abstract thought and reasoning characteristic of normal adults.

A retarded child's feeding skills are usually consistent with his or her general level of development or "mental age." Feeding skills may be even further behind the level of development expected for the child's chronological age because of physical handicaps. It is important to remember that a retarded child's progress in all areas, including development of feeding skills, will be slow. To establish reasonable expectations for progress, an interdisciplinary evaluation of the child should be done, including an evaluation by a psychologist experienced in working with retarded and otherwise handicapped children.

There are also relatively minor deviations from normal cognitive development called learning disabilities. They have little or no relation to feeding skills and need not concern us here.

PHYSICAL DEVELOPMENT

Normal Development

In considering physical growth and development, definitions should be reviewed. Growth, as defined by Cheek and Cooke (1964), is physiological accretion of new tissue reflected in the acquisition of protein and water. Development means a gradual change toward greater complexity and an increased differentiation of functions (Breckenridge and Vincent, 1966). Principles of development, as outlined by Crase (1971), include:

1. Development is similar for all people.
2. Development proceeds at different rates.
3. Development proceeds from the simple to the complex.
4. Development proceeds from the general to the specific.
5. Development is continuous.

Appendix II shows the stages of physical development from conception to 18 years of age.

Heredity, environment, and early experiences influence development. While all three factors play major roles, the relative importance of each has not been established.

Physical growth and development often are considered to commence at the time of conception and end with death. However, the process actually begins prior to conception and includes the hereditary and environmental factors of the parents, the grandparents, and even the great-grandparents.

Growth occurs within each organ and tissue of the body in a precisely timed, established sequence. If factors interfere with growth at critical periods, the optimal growth of the given organ or tissue may never occur. In the brain, each region appears to have only one opportunity to grow. Thus, distortions of brain regions caused by lack of proper growth are not reversible. The postnatal growth rate for various body organs and systems was determined by Scammon in 1929 (Fig. 1). This figure illustrates that most neural growth occurs postnatally. Studies by Dobbing (1975) indicate that brain growth begins and proceeds rapidly during fetal development. Brain growth and development are crucial for normal physical growth and development of body tissues, organs, and systems. Figure 2 depicts the changes in bodily proportions from infancy through adulthood. The brain undergoes the most rapid growth phase during the last half of pregnancy and the first two years of life, so that the brain and head reach maximum size much earlier than the rest of the body.

The importance of monitoring the physical growth and development of infants and children cannot be overemphasized. An accurate picture of motor, social, and language development as well as adaptive behavior are parameters to assess. The knowledge of developmental milestones should be a part of the armamentarium of all maternal and child health professionals. From an awareness of

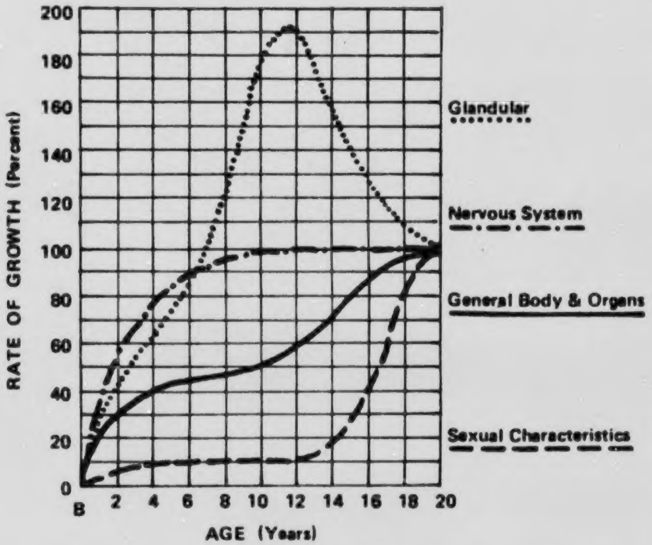

Figure 1. Major types of postnatal growth of various body parts and organs.

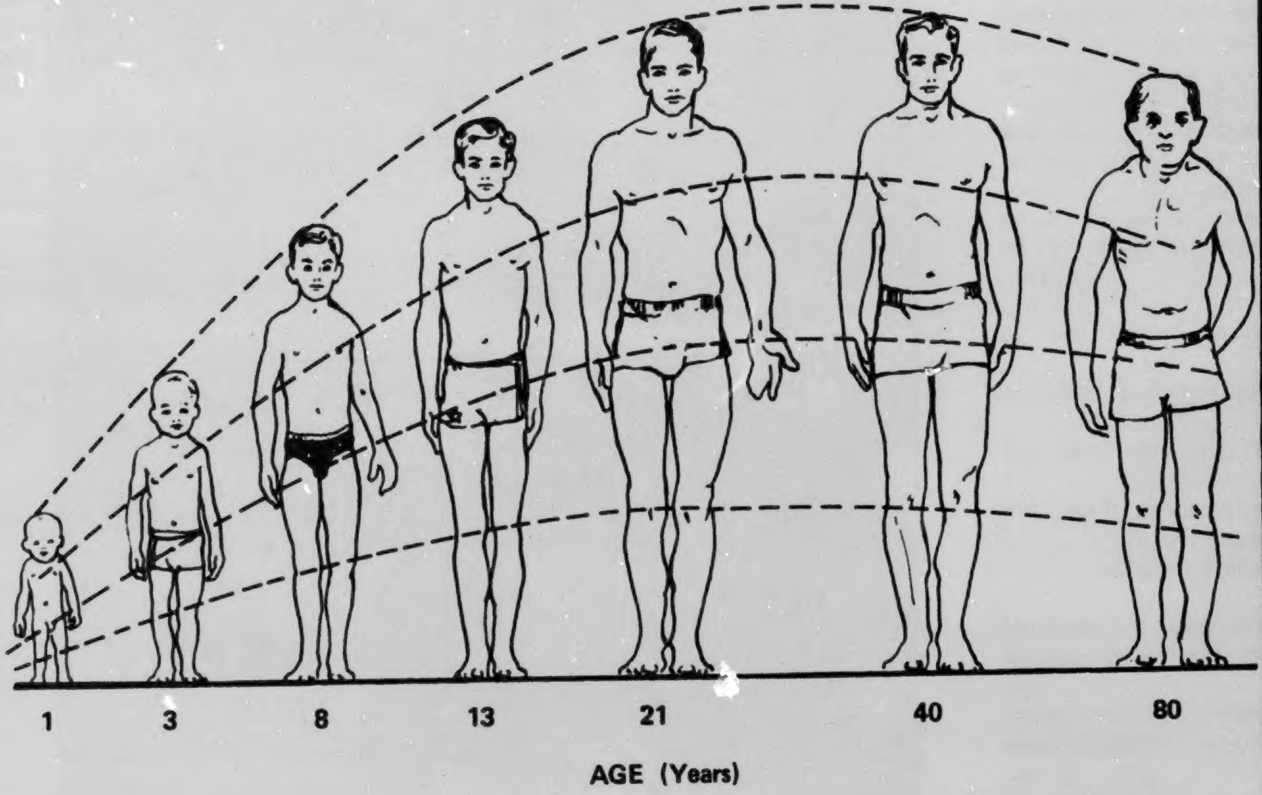
1
3
8
13
21
40
80
AGE (Years)

Figure 2. Growth of Human Body

deficits or developmental variations, special needs can be identified and appropriate referrals for further investigation and treatment can be made — whether these variations are genetic, physical, mental, emotional, or intrafamilial in origin. Particular attention should be given to infants, small children, and adolescents.

Deviations or Problems

Deviations in normal growth and development as well as disorders of organs, tissues, and systems may lead to physical defects that result in feeding problems. Some of the most common of these are outlined in Table I. It should be recognized that interrelationships exist between these systems. Thus, many of the deviations cited could be grouped as well under other areas. Special attention is required for infants and children with these conditions, which often affect their eating, feeding, and nutrient utilization.

Nutrition plays a paramount role in human growth and development. Without a doubt severe, prolonged malnutrition during growth results in alterations in the size and form of organs and tissues, as well as the total physique. Adverse effects on brain growth result in lasting physical growth retardation as well as behavioral changes. Chronic undernutrition often leads to anemia, which results in apathy, loss of learning time, and behavioral changes that are difficult to understand and document.

The specific role of nutrition as a cause of developmental problems is not clearcut. The interrelationships between nutrition and other environmental and genetic factors need further study; however, each is important, and health professionals should strive to assess and recommend positive steps to assure that all infants and children through adolescence receive proper nutrition and have educational and environmental enrichment programs to maximize their genetic potential.

Table I. Deviations in Systems and Disease Processes that Result in Delays and Defects in Physical Growth and Development

SYSTEMS	COMMON DIAGNOSTIC CATEGORIES
Biochemical/Hormonal/Nutritional/ Metabolic/Gastrointestinal	Inborn Errors of Amino Acid, Carbohydrate and Fat Metabolism; Diabetes; Hypothyroidism; Failure to Thrive; Specific Nutritional Deficiency Diseases; Ulcer; Esophageal Insufficiency; Gastroenteritis; Goiter
Cerebrovascular	Congenital Heart Disease; Hemorrhage; Thrombosis; Embolism; Ischemia; Hypertension; Heart Murmur; Stroke
Genetic	Chromosomal Defects (Down Syndrome); Inborn Errors of Metabolism; Specific Syndromes (Cornelia DeLange, Rubenstein-Taybi, Turner's); Cleft Palate; Dwarfism
Genitourinary	Urinary Tract Infections; Nephritis; Hypertelorism-Hypospadias Syndrome
Hematopoietic	Hemophilia; Anemias; Fanconi Syndrome; Leukemia
Infective/Parasitic	Encephalitis; Meningitis; Tuberculosis
Muscular	Muscular Dystrophy; Multiple Sclerosis; Myelomeningocele; Spinal Cord Injuries
Neoplasms	Malignant or Benign Neoplasms of the Brain or Other Areas of the Central Nervous System or Other Organs Affecting Food Intake, Assimilation, and Utilization
Neurological	Macrocephaly; Microcephaly; Cerebral Palsy
Ophthalmolgical	Blindness
Oral/Dental/Facial	Abnormalities of Structure of Soft and Hard Tissues of Mouth Tongue Abnormalities; Gingival Involvement; Dental Caries; Delayed Tooth Eruption or Congenital Absence of Teeth; Cleft Palate and Lip; Enamel Hypoplasia
Otological	Deafness
Psychiatric/Behavioral/Psychological	Autism; Hyperactivity; Anorexia Nervosa; Pica; Dysphagia; Obesity; Rumination
Respiratory	Tonsillitis; Sinusitis; Pneumonia; Bronchitis; Asthma
Skeletal/Bone/Connective Tissue	Achondroplasia; Rickets; Apert's Syndrome; Marfan's Syndrome; Hurler's Syndrome; Mucopolysaccharidosis

NUTRITION

Normal Nutrition

From conception to attainment of full body development and until death, nutrition is fundamental to the quality of life for all people. Very simply, nutrition can be defined as food and its relation to health. The American Medical Association offers a more complete definition – "Nutrition is the science of food, the nutrients therein, their action, interaction and balance in relation to health and disease, and the processes by which the organism ingests, digests, transports, utilizes, and excretes food substances."

Through metabolic processes the body breaks down, synthesizes, and transforms nutrients into materials for formation, growth, repair, and maintenance. Forty nutrients play an essential metabolic role and are categorized by chemical composition. The categories are carbohydrates, proteins, fats, vitamins, minerals, and water. It is through the process of digestion, absorption in the small intestine, and transportation via the blood system to the cells that nutrients are utilized by the body.

Carbohydrates, comprised of starches and sugars, provide approximately 50 percent of total kilocalories. They are found in vegetables, fruits, breads, cereals, and dairy products. One gram of carbohydrate yields four kilocalories. At the cellular level (regardless of source) carbohydrate is broken down to glucose – the body's fuel.

Proteins are used primarily in the body as building blocks for growth, repair, and maintenance. The essential amino acids, the component parts of protein that cannot be synthesized by the body, are found in meat, fish, poultry, dairy products, and meat substitutes. Though vegetable products contain protein, they do not supply all the essential amino acids. Protein provides four kilocalories per gram consumed, and about 20 percent of total kilocalories used by the body are derived from protein.

The remaining 30 percent of the body's total kilocalories are provided by fat. Fat yields nine kilocalories per gram and is a very concentrated energy source. All animal products contain fat, as do some nonanimal sources (olives, avocados, seeds, nuts). Fat serves as the carrier for fat-soluble vitamins A, D, and E and provides essential fatty acids, which are necessary for growth, reproduction, and healthy skin.

Minerals are supplied through a variety of sources. Seventeen are essential to human nutrition. Minerals function as catalysts for biological reactions and regulatory compounds (as in hormones, acid-base balance, water balance, and neuro-transmission). The structural components of tissue are minerals (hemoglobin in blood; calcium in bone).

Mainly serving as facilitators of enzyme function, vitamins are found in vegetables, fruits, grains, meats, and dairy products. Quantities present in food are minute. Vitamins are necessary for many body functions. Since the exact biochemical role of some vitamins has not been determined, some controversy regarding level of vitamin need for health persists.

Water comprises 60 to 70 percent of total body weight. Second only to oxygen in maintaining life, it performs varied functions including regulation of body temperature and lubrication of moving body parts.

The body is a miraculous machine, determining its daily usage of nutrients. Nutrient needs are affected by age, sex, state of health, and activity. Excessive kilocalories are converted and stored as body fat. Water-soluble vitamins are excreted by the body due to limited storage capacity. Fat-soluble vitamins, on the other hand, are stored. Thus, an excess of fat-soluble vitamins may produce toxicity.

The handling of excessive minerals by the body varies. Some minerals are excreted while others such as iron are retained, causing toxicity (iron overload). A deficiency of minerals has been demonstrated to lead to disease. Deficiency states develop slowly, so there may be no clinical signs of the condition for a long time. Unless brought on by the stress of an illness or found on a routine dietary assessment, subclinical vitamin deficiencies may never be diagnosed. This points out the need for dietary assessment in routine medical practice.

The Food and Nutrition Board of the National Research Council updated its guidelines for nutrient needs for groups of normal healthy people by publishing the ninth edition of the Recommended Dietary Allowances in 1980. The allowances, or RDA's, provide recommended nutrient and kilocalorie levels – they are not minimum requirements. A margin of safety is added to the minimum levels to allow for nutrient requirement variations among population groups. These guides were not designed to assess individual diets. Since the true nutritional needs of the handicapped have not been shown to be different from the normal population groups, these RDA's are believed applicable for comparison of the nutrient content of diets of the handicapped as a group. Since no guides are available for assessment of individual diets, the RDA's are often used as a basis for recommendations. Limitations of the RDA's must be understood when they are used in nutrition assessment.

The five food groups were devised by the U.S. Department of Agriculture (USDA) to translate the RDA's into a usable plan of dietary patterns. This pattern is known as *The Hassle-Free Daily Food Guide* (1980). Foods are grouped into vegetable/fruit, bread/cereal, milk/cheese, meat/poultry/fish/beans, and fats/sweets/alcohol. Foods in the last group provide kilocalories but few nutrients, so they should be added only after other needs are met — and then intake should be limited. The number of servings needed from each of the food groups varies with age and activity level. Appendix III provides guidance on selecting the appropriate amounts of food to meet the daily needs of various age groups. The amounts outlined meet the RDA's for all nutrients except vitamin D. For the age groups one to three, four to six, and seven to ten, additional vitamin D in the amount of 100-200 International Units is recommended daily, especially for children taking anticonvulsant medications or for those who are nonambulatory and seldom in the sunlight.

Nutritional requirements vary during the life cycle. Nutritional needs are greatest during periods of rapid growth and decrease as growth slows or ceases. Periods of peak nutritional needs come between birth and two years of age and at adolescence. Careful attention must be given during these growth periods to assure adequate nutrients and energy to promote optimal growth, development, and health.

The intake of adequate diets is sometimes hampered by poor food habits or mismanaged mealtimes, which lead to negative feeding experiences and refusal to eat. Appetites fluctuate with age and stage of development. Children often judge their nutritional needs better than anyone else. When children reach age two and growth slows, they do not need as much food. They say "no." Caretakers and health professionals must understand the "why" of the "no" and not force feed. When adolescents reach their growth spurts, their appetites increase. Attention to food choices is important. Peer pressure and a need to be assertive may have adverse affects on food selection unless positive foods habits have been formed during the grammar school years — the time nutrition education should be given in schools and at home.

Deviations or Problems

The major deviations in nutrition status are linear growth delay or short stature, underweight, overweight, and anemia. Infants who are unable to ingest sufficient food to meet their minimum requirements for kilocalories are frequently growth delayed and underweight. Metabolic problems such as phenylketonuria cause growth delay, underweight, and mental retardation. Children with malabsorption syndromes are delayed in growth, underweight, and frequently anemic. In certain conditions like Down syndrome and Prader-Willi syndrome, children become overweight unless food intake and activity are monitored. In all these examples, a physical anomaly or condition underlies the nutrition problem. Crucial to the prevention of these nutrition problems are early diagnosis and early dietary treatment.

There is another cause of deviations in nutrition status: mismanagement of the feeding situation because of a lack of understanding of what, how, and how much to feed the child. This is a totally preventable nutrition problem, which usually results in overweight or underweight.

Tables II and III provide a summary of deviations in nutrition status in 2051 retarded and handicapped children who received nutritional assessments at The University of Tennessee Child Development Center over the 10 year period, 1967-1976. These data were for children from birth to 18 years of age who were initially suspected of being mentally retarded. Sixty percent were males and 40 percent were females; 75 percent were white and 25 percent were black. Forty percent were not mentally retarded, and 60 percent were retarded or below average intellectually.

Table II. Nutritional Status of 2,051 Children Referred to the University of Tennessee Child Development Center, fiscal years 1967 – 1976

	Percent Total (n=2,051)	Percent Retarded (n=1,230)	Percent Not Retarded (n=821)
Short Stature	32	65	16
Overweight*	13	10	20
Underweight**	11	17	6
Anemia	12	12	13

*More than 15% above the mean weight for height according to the Boston Anthropometric Chart or the National Center for Health Statistics' Growth Chart.

**More than 15% below the mean weight for height according to the Boston Anthropometric Chart or the National Center for Health Statistics' Growth Chart.

Table III. Factors Affecting Nutritional Status of 2,051 Children Referred to the University of Tennessee Child Development Center, fiscal years 1967 – 1976

	Percent Total (n=2,051)	Percent Retarded (n=1,230)	Percent Not Retarded (n=821)
Poor Food Habits	20	22	17
Mechanical Feeding Problems	10	14	4
Delayed Weaning	10	17	0
Constipation	6	9	3
Depressed Appetite	5	6	3
Delayed Feeding Skills	5	8	1
Bizarre Food Habits	4	5	2
Food Allergies	4	5	3
Early Feeding Problems	4	5	2
Pica	2	3	1
Mealtime Behavior Problems	2	2	2
Inadequate Intake*			
Kilocalories	27	35	15
Protein	1	1	1
Vitamins			
A	13	12	14
D	43	44	46
C	18	15	13
Thiamine	8	8	7
Riboflavin	5	5	3
Niacin	13	14	13
Minerals			
Calcium	24	24	23
Iron	40	40	41

*Less than 66% of Recommended Daily Allowances for age, calculated from three-day food diaries kept by caretakers.

REFLEX DEVELOPMENT

Normal Development

The early reflexive responses of the newborn are usually in response to external stimuli. For example, the child turns the head in search of food when the area of the mouth is stimulated due to the rooting reflex. The entire body moves in a reflexive pattern, usually in response to any stimuli. These early responses are aimed toward survival and must be relied upon until the nervous system is more mature. With maturation, more postural reflexes emerge. The primitive reflexes, which are present at birth, provide a foundation for progression toward motor control. As they are replaced by postural reactions at four to six months of age, righting and equilibrium responses emerge, promoting greater control. Although persistence of any primitive reflex past the time of normal integration can cause problems in feeding, some reflexes appear to cause more problems than others.

Asymmetrical Tonic Neck Reflex

The asymmetrical tonic neck reflex (ATNR), one of the reflexes present at birth, is elicited by turning the head (Fig. 3). As the head is turned, the arm on the chin side increases in extensor tone while the arm on the skull side increases in flexor tone and/or decreases in extensor tone (Magnus, 1926). For most children, the ATNR is integrated by four to six months of age (Paine, 1964). The abnormal presence of the ATNR in older infants can severely interfere with feeding, particularly in the use of a spoon or other utensil.

Moro Reflex

The Moro reflex, like the ATNR, is elicited by movement of the head (Fig. 4). If the head is suddenly dropped backward, the arms initially abduct and flex, then return to a "clasping" position. The response is present at birth but is integrated by most infants between five and six months of age (Saint-Anne Dargassies, 1966). If the head is allowed to drop backward during mealtime, the child who continues to have a Moro reflex is likely to fling any object held in the hand, such as food or a spoon. Positioning is important if feeding skills are to develop.

Tonic Labyrinthine Reflex

The tonic labyrinthine reflex is normally present in infants until six months of age (Fukuda, 1961). This reflex is seen when the infant is either prone or supine. In the prone position (lying on stomach), infants with the tonic labyrinthine reflex have increased flexor tone. However, when in the supine position (lying on back), infants have increased extensor tone (Fig. 5).

This reflex has major implications for the child who drops his head backward and lets the food slide down his throat when sitting in a chair and being fed by an adult. Such a "birdfeeding" position reinforces the tonic labyrinthine reflex. By holding the infant in her arms in a slightly reflexed position, the mother or caretaker can inhibit the reflex and prevent "birdfeeding."

Symmetrical Tonic Neck Reflex

The symmetrical tonic neck reflex (STNR) is also elicited by movement of the head with resulting changes in muscle tone in the arms and legs. The STNR is not considered a primitive reflex since it is not present at birth. However, it is usually present at six months of age when the asymmetrical patterns are being integrated, and it continues until eight to twelve months of age (Milani-Comparetti, 1967).

Infants with an STNR have increased flexor tone in the arms and increased extensor tone in the legs when the head is flexed. If the head is extended, an increase in extensor tone is seen in the arms, and an increase in flexor tone is noted in the legs (Fig. 7). For the infant who continues to be influenced by the STNR, the head should be positioned in an erect posture during mealtime to enhance muscle tone in the arms (Fig. 8).

Rooting and Sucking Reflexes

Other primitive reflexes prepare the infant for development of feeding skills. During the first few months of life, the infant depends upon the rooting reflex to locate the source of food, such as the mother's breast or the bottle nipple. The sucking reflex then allows the infant to ingest the food. Both of these reflexes are present during the first three months of life (Mueller, 1972; Saint-Anne Dargaisses, 1966).

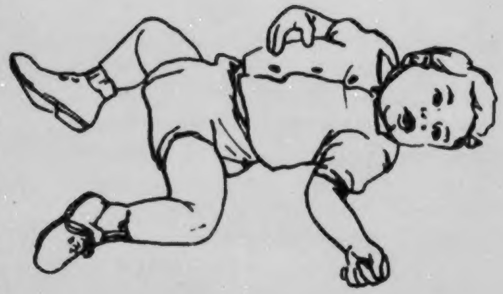
Figure 3. Asymmetrical tonic neck reflex.

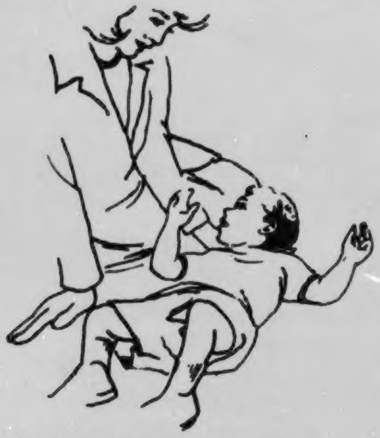
Figure 4. Moro reflex

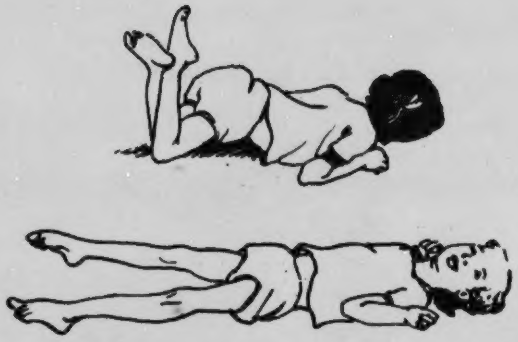
Figure 5. Tonic labyrinthine reflex, prone and supine

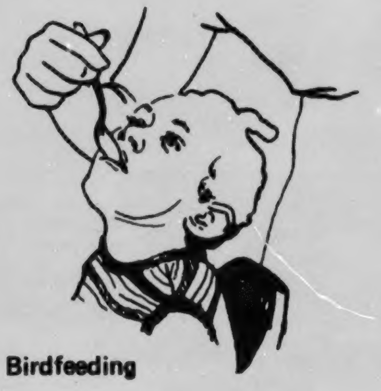
Figure 6. Birdfeeding

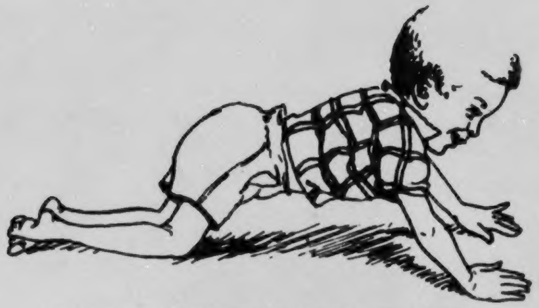
Figure 7. Symmetrical tonic neck reflex

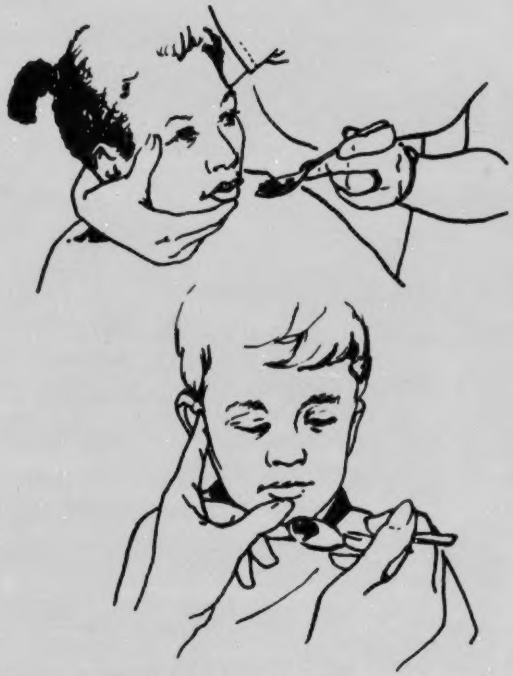
Figure 8. Positioning to overcome symmetrical tonic neck reflex

Gag and Bite Reflexes

The gag reflex, which is present from birth throughout life, allows the infant to ingest the food without aspirating it into the lungs. Problems in feeding may occur when the gag reflex is either hypoactive or hyperactive. A phasic bite reflex is normally present in infants from shortly after birth until three to five months of age. This reflex prepares infants for later munching and chewing. A tonic bite reflex produces a strong closure of the jaws when the gums or teeth are stimulated, which limits the size of food particles allowed in the mouth and interferes with the release of the infant's jaw after biting down on the food or spoon. Further discussion of these reflexes is found in the section on oral-motor development.

Righting and Equilibrium Responses

As the nervous system matures, righting and equilibrium responses allow the child to assume upright positions. For sitting with hand support, the infant must develop protective responses of the upper extremities when moved horizontally or diagonally. By learning to free the hands from a supporting role, an infant is able to make normal protective responses (see Fig. 9). The forward response develops between six and nine months; the sideward response, at approximately seven months; and the backward response, at nine to ten months (Andre-Thomas & Saint-Anne Dargassies, 1960; Pain, 1964; Bobath, 1967; and Milani-Comparetti, 1967). These responses enable the infant to sit steadily and come to sitting independently from prone or supine. If the responses are too slow or do not develop at all, the infant may be injured when sitting because of inability to protect himself.

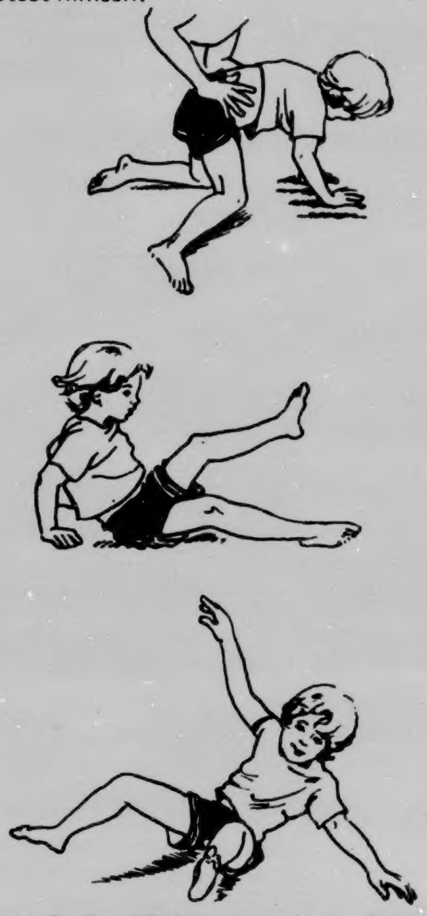

Figure 9. Equilibrium responses – forward, backward, and sideward

Tilting responses are also equilibrium responses that enable the infant to sit steadily even when the surface is displaced (Fig. 10). In tilting responses, the infant is able to maintain balance by adjusting the total body when the surface is moved. Movement of the trunk away from the tilt allows the infant to remain erect and steady. Tilting responses in sitting are developed between seven and eight months of age (Milani-Comparetti, 1967; Bobath, 1967). These reactions in sitting are necessary if the infant is to sit without hand support and actively participate in self feeding.

The infant's progression through the primitive reflexes and the higher level equilibrium responses are necessary for the development of normal movements. Since development of feeding skills is dependent upon gross and fine motor skills, the persistence of primitive reflexes has a profound effect upon positioning and handling the infant.

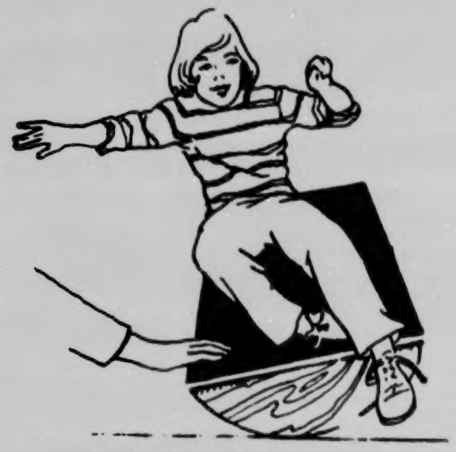

Figure 10. Tilting response

Table IV. Selected Reflexes and Their Feeding Implications

REFLEX	DESCRIPTION	ABNORMAL	FEEDING IMPLICATIONS
Asymmetrical Tonic Neck (ATNR)	Elicited by turning the head; as head is turned, the arm on the chin side has increased extensor tone while the arm on the occipital side has increased flexor tone. See Figure 3. Present from birth through 4 months of age.	Response beyond 6 months; response is never consistently obligatory in a normal infant; response delay may be many seconds in infants with pathology.	Prevents the child from bringing hands to the midline. Prevents bringing hand to the mouth as hand child is looking at is extended.
Moro	Elicited by supporting the head in midline and letting the head drop backward before stopping it. Initially arms abduct and then return to the midline. See Figure 4. Present from birth until 6 months of age.	Response beyond 6 months; asymmetrical response may indicate abnormality.	Prevents infant from holding bottle or from finger/spoon feeding as slight head drop backwards causes infant to fling object. Prevents infant from developing good sitting balance and some protective responses.
Tonic Labyrinthine	Supine: Infant has increased extensor tone when lying on back. Prone: Infant has increased flexor tone when lying on stomach. See Figure 5. Both responses present until 6 months of age.	Response beyond 6 months.	If infant is fed lying flat on his back, choking may occur because of the extension at the neck. Birdfeeding position (Fig. 6) reinforces this reflex. Seating or holding an infant in slight flexion helps overcome strength of reflex.
Symmetrical Tonic Neck (STNR)	Elicited by flexing and extending the head; extension of head produces extension of arms and flexion of legs; flexion of head produces flexion of arms and extension of legs. See Figure 7. Usually appears 6 months of age and disappears by 12 months, although great variances reported.	Response beyond 12 months.	Seating child in erect posture during mealtime enhances muscle tone in arms. See Figure 8. Continuation of this reflex prevents the child from extending arms to pick up food or utensils and flexing arms to bring them to the mouth.

GROSS MOTOR SKILL DEVELOPMENT

Normal Development

Motor function can be divided into gross motor and fine motor behaviors. Gross motor function is defined as the use of the large muscle groups in activities such as postural reactions, head balance, sitting, standing, creeping, and walking (Gesell & Amatruda, 1974). All motor development, whether fine or gross motor, follows set patterns.

Development occurs in a cephalocaudal progression (from head to toe). Head control is thought to be a building block for other developmental skills. If the muscles supporting the head are weak, the child is apt to have difficulties in sucking and swallowing because the head cannot be held in line with the body.

Development proceeds from simple to complex. The child moves from simple tasks such as learning to place his hands on the bottle, which uses mass movements of the arms, to more complex tasks such as bringing the bottle to his mouth, which combines both gross and fine motor skills.

Development occurs in a proximal to distal fashion. For example, the child generally must be able to control the shoulder before mastering use of the hand.

Although each child follows the same pattern of development, individualized variations are seen, particularly in the rate of attainment of motor milestones. A certain amount of variation from the mean is considered normal; age ranges, rather than specific ages, are most useful.

Gross motor skill development is basic to other areas. If the young child has weakness in the muscle groups that support the head, it is possible that the oral muscles are also weak. The child who has difficulty controlling gross movements is also likely to have difficulty with fine movements. The problems a child experiences with gross motor activities may also limit exploration and manipulation of the environment, thus impairing intellectual and self-help abilities.

Patterns of gross motor functions are applicable to other patterns of development in the child, especially as related to feeding skills. During the first three months of life, the child is predominantly in a flexed and adducted posture, often called the fetal position. This posture initially enables the child to "cuddle" to the mother during feeding or in preparation for being fed. During this period of time, the infant assumes a flexed posture in both the prone and supine position and has difficulty in initiating extension. Toward the end of the third month, the flexion adduction patterns change to flexion abduction. The infant begins to lift his head when in prone and get onto forearms. This activity is preparatory for increasing extension of the trunk for later activities. In the supine position, the infant begins to hold the head in midline, bringing his hands together and maintaining the legs in a flexed abducted posture. At the end of the third month, the infant should have only a slight head lag when pulled to sitting and once in a sitting position should be able to hold his head erect. Feeding at this time should be done in an upright posture.

At the end of the fifth month, another pattern of movement emerges. The beginning of extension abduction posturing of the arms and legs is seen as well as symmetrical posturing. The infant often assumes the pivot prone position, holding the head high while arching the entire body. This allows him to reach for objects when propping on one arm in the prone position and to pivot to get objects within reach. In supine, the infant begins to lift the head and can bring hands to midline. During this time, the infant can easily grasp a bottle and bring it to the mouth. However, support is needed in sitting. A chair provides support for the trunk so that the infant's hands are free for feeding.

By six months of age, the infant can explore his environment by rolling from prone to supine and back to prone. Strong extension abduction of the limbs is noted, particularly when the child is in prone or is supported sitting. As sitting balance begins to develop, the infant initially leans forward. Support is still needed when the infant is fed either in a chair or in the parent's lap.

Rotation in sitting begins by eight months of age and is perfected by nine months. By nine months the infant is able to balance well when sitting and needs no assistance to recover balance when moved forward and sideways. The infant is able to obtain toys slightly out of reach. During this period, the infant should be able to use the hands for feeding, since they are no longer needed for balance.

During the next several months, the infant learns to pull to standing and stand holding onto furniture. By the end of the tenth month, the infant's sitting balance is perfected, with good balance forward, backward, and to the sides. By twelve months of age, the child has mobility by creeping on hands and knees or by holding onto furniture for walking. Some children walk independently by twelve months of age; however, others may not walk until fifteen to eighteen months.

By eighteen months, children are usually independent in their mobility patterns. They are capable of rising to standing and walking alone. Many children become master climbers, climbing in and out of their high chairs independently. They can sit in a small chair at a table and have enough trunk control to reach for objects placed in front of them or to the sides.

Deviations or Problems

Unfortunately, normal development as described above does not occur in all infants. Abnormal muscle tone (hypotonia-hypertonia, or fluctations of tone) interferes with the child's progress in achieving head control, sitting balance, and mobility. Increased muscle tone will often cause the child who is being held to thrust the head backwards. "Birdfeeding" during mealtime can occur with extensor thrusting. If decreased muscle tone is present, similar problems such as "birdfeeding" or the inability of the child to hold his head erect can occur. At mealtime, the child may allow his head to droop forward or fall backward. In addition, the presence of abnormal muscle tone may interfere with the development of normal extension, which is necessary for the child to sit erect and independently in the high chair. Rotation may also be impaired if the child has too much or too little tone.

Orthopedic problems such as scoliosis or lordosis may cause impairments in the child's sitting abilities. If unable to assume an erect posture due to bony deformities, the child may be required to use the hands for balance or support. Self-feeding skills may be delayed because of the inability to use the hands freely. Restrictions in range of motion due to either bony deformities of the upper extremities or increased muscle tone may also hamper the child's ability to use the arms.

FINE MOTOR SKILL DEVELOPMENT

Normal Development

Fine motor skills comprise reach, or the transportation of the hands toward an object; grasp, or the closure of the hand on an object; and release, or the placement of an object. In relation to fine motor development, the term "manipulative skills" refers to the movement of objects while they are being held. Observation of fine motor skills provide valuable information about a child's developmental level, as well as several factors related to feeding.

For independent spoon feeding, the child must voluntarily grasp a spoon, fill the spoon with food, direct the loaded spoon to the mouth, insert the spoon into the mouth, remove the food from the spoon, and remove the spoon from the mouth to start the process again. This complex sequencing requires precision and perceptual awareness.

Fine motor development has been well documented (Halverson, 1932; Gesell & Amatruda, 1974; Bruner, 1968; Twitchwell, 1970; White, Castle, & Held, 1964). The grasp reflex, which is seen in the newborn when the infant's palm is touched, is usually integrated at the same time voluntary grasp is beginning, at approximately three months of age. During the third month, the infant brings the hands together in play (this is also called mutual fingering). Fingers are used at this time for raking. If a raisin is placed on a table in front of the infant, the fingers will scratch for it.

At approximately four months the infant reaches for an object, but usually overshoots or undershoots it. Between the fifth and sixth month the infant retains objects such as cookies or crackers using a whole hand grasp. By the seventh month the infant finger-feeds himself, holding a cookie in one hand while taking a second one in the other hand. The banging of objects such as spoons or cups on the table top is common.

Between nine and ten months the infant is able to pick up small objects, such as raisins, between his forefinger and thumb (Fig. 11a). Voluntary release is beginning.

When the child reaches one year of age, small objects can be picked up between the tips of the thumb and forefinger in what is called a neat pincer grasp (Fig. 11b). Around this time deliberate dropping and throwing of objects can be observed, especially at mealtime.

Once the child is mobile and no longer needs to use the upper extremities for support in crawling or sitting, the hands are free to explore the environment. Purposeful activities such as stacking blocks, drawing, and cutting with scissors incorporate coordination of vision with fine motor skill. By four years of age the child is able to feed himself independently with a fork, button large buttons, and write with a crayon. Children at this age often are able to hold the pencil or crayon between the thumb and next two fingers in a three jaw chuck grasp, or tripod grasp (Fig. 11c).

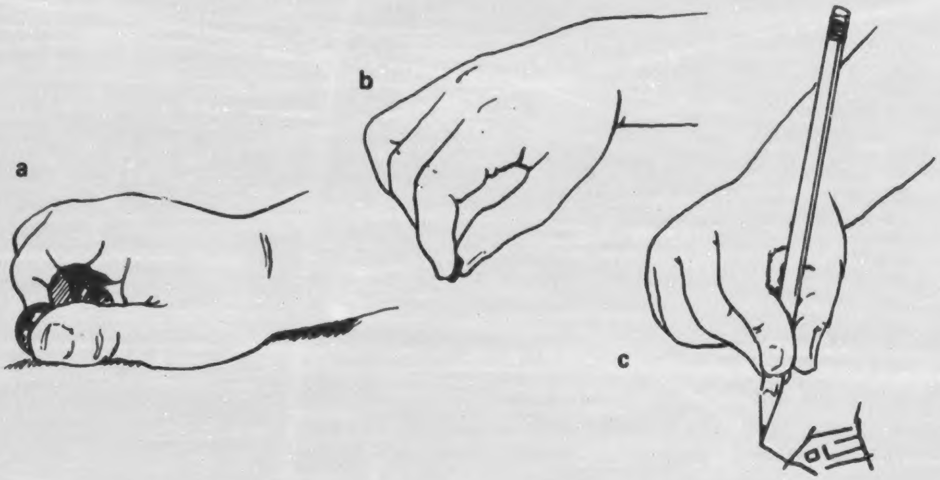

Figure 11. a - Inferior pincer grasp b - Neat pincer grasp c - Three jaw chuck

By seven years most children can write and hand dominance has been well established. All mature types of grasp are present and are used appropriately. The child is skilled in using each finger separately (e.g., dialing a telephone, squeezing a water pistol, or pressing elevator buttons). There is fairly smooth coordinated use of all the fingers by seven years. Practice leads to increased coordination and precision of individual finger movements for complex tasks such as piano playing and typing.

The area of fine motor development has been the subject of several interesting studies. Kopp (1974) demonstated that more "coordinated" infants do significantly more object-exploring, both manipulative and oral, than those who are "clumsy." The work of Bower (1977) indicates that specific environmental experiences play a major role in the development of motor skills.

A child's preference for one hand or the other (also called handedness or hand dominance) can usually be seen by the second year of life. A child's handedness or delay in establishing hand preference is sometimes associated with subsequent problems. The review by Touwen (1972) on laterality and hand dominance is particularly useful on this topic.

Deviations or Problems

Delayed fine motor development is characteristic of mental retardation and developmental disorders. Down syndrome is one condition in which delay of fine motor skills may be expected. Studies (Connolly & Russell, 1976) have shown that early intervention can boost developmental progress and ease the burden of the handicap.

There are many congenital physical anomalies that affect the use of the upper extremities; for example in Apert's Syndrome the fingers are webbed. Deficits involving the peripheral nerves result in motor and sensory problems (insensitivity to light touch, pain, pressure, and temperature sensations). Mastering feeding skills is difficult when sensory deficits are present. Learning to feed unassisted as well as other self-help skills are seriously impaired in those without fingers, hands or arms, whether resulting from birth defects or accidents. Children with learning disabilities may have eye-hand coordination difficulties resulting in inability to spread with a knife or cut with a knife and fork.

ORAL-MOTOR DEVELOPMENT

Normal Development

The mouth and the structures around it form a major doorway between the child and his environment. Normal oral-motor functioning during eating is important not only for proper nutrition and growth, but also for appropriate development in other areas:

a) Cognitive – A child's early exploration of the world involves mouthing foods of various textures and tastes, as well as toys and other objects. These mouthing experiences are one basis for early learning.

b) Affective – Bosma (1977) describes the mouth as a "cue area" for behavior of the whole child. In the child with normal oral-motor development, eating may be the single daily activity which best nurtures feelings of security, pleasure, and satisfaction. These feelings are prerequisites for the later development of independence and exploration.

c) Communicative – "The well-coordinated mouth movements used for speech development are built on the foundation of good chewing, sucking, and swallowing movements in eating" (Wilson, 1977).

Understanding the normal pattern of oral-motor development is essential for assessing children who demonstrate feeding problems. The following information provides an overview of normal oral-motor growth in: 1) the sucking and swallowing of liquids; 2) spoon feeding; and 3) chewing (Evans-Morris, 1977). By one and one half years, the child has developed all the oral movements needed for feeding, except refined rotary jaw movement.

1) Sucking and Swallowing Liquids (from breast/bottle feeding to cup drinking)

Infants are equipped at birth with automatic or reflexive means of seeking out food. Through the rooting reflex, the infant turns the head and extends the tongue in the direction of a light touch to the upper or lower lip, or corner of the mouth. The palmomental reflex allows the neonate to open the mouth and begin sucking when touched on the palm of the hand. Both reflexes are present in the normal infant during the first three months of life.

Although sucking may be observed in the newborn during the first two weeks of life, the predominant feeding pattern during the first five or six months is suckling. Suckling consists of the following components: rhythmical protrusion-retraction of the tongue as it presses against the nipple; loose approximation of the lips; and wide opening-closing movements of the jaw. By six to eight months suckling is gradually replaced by a sucking pattern, consisting of up-down movements of the tongue, a firmer lip seal, and less prominent jaw movements. "The normal child is free to choose the sucking or suckling pattern best suited to his needs at the moment" (Evans-Morris, 1977). Moreover, both suckling and sucking trigger a chain reaction involving rhythmic integration of suck, swallow, and breathing.

Cup drinking is usually introduced at four to six months of age. Until just over one year, early cup drinking is characterized by suckling-sucking movements of the tongue, a poor lip seal, and wide up-and-down excursions of the jaw. Liquid intake in cup drinking increases by fifteen to eighteen months, with gradual improvement in lip activity and jaw stabilization (through biting down on the edge of the cup). By two years of age the normal infant is able to drink effectively from a cup. Tongue-tip elevation is evident during swallowing; and jaw stabilization is achieved through activity of muscles controlling the temporomandibular joint.

2) Spoon Feeding of Semi-Solids

When spoon feeding is first introduced, the normal infant typically demonstrates little lip activity in clearing the spoon. The infant begins suckling at the sight of food approaching the mouth, and the tongue and jaw tend to move together. By six months of age, the lips help in removing food from the spoon, and tongue movements are adequately refined for efficient spoon feeding. The normal infant is then able to do the following: use the upper incisors or gums for clearing food from the lower lip, achieve a lip seal during swallowing, actively produce tongue tip elevation free of jaw activity, and grade jaw movements according to the size of the food.

3) Chewing

The precursor of chewing is the phasic bite reflex, present in the normal infant from birth through the first three to five months of life. The phasic bite reflex involves a series of opening-and-closing jaw movements in a rhythmical bite-release pattern, in response to stimulation of the gums. At about five months of age, before the teeth are present, the infant exhibits a munching pattern characterized by up-down jaw movements and flattening-spreading movements of the tongue. By six months of age, true chewing behaviors begin to emerge. Initially food particles are broken up by up-and-down jaw movements and unrefined side-to-side movements of the tongue. Gradually, along with the development of increased lip closure and lateral jaw movements, tongue activity is refined (narrowing, pointing, lateralizing), so that the infant is able to move the food around in the mouth. Early developing vertical and lateral movements of the jaw are gradually refined into a rotary chewing pattern, which continues into adulthood.

Deviations or Problems

Many of the oral behaviors which emerge during the first two years of life continue to be used by the normal adult during eating. These normal movements include the gag reflex, sucking, jaw stabilization, tongue-tip elevation, a mature sustained bite, a munching pattern, chewing, tongue lateralization, and rotary jaw movements. (See the glossary for defining features).

However, certain early developing movements of the oral mechanism normally disappear at predictable ages and are replaced by new, more mature behaviors. Frequently children with feeding problems exhibit delayed oral development involving the abnormal persistence of primitive movements such as the rooting reflex, the phasic bite reflex, suckling, and inadequate jaw grading. Delayed feeding development may also be related to inadequate structure or strength of the oral mechanism, or inappropriate muscle tone. For example, many children with Down syndrome demonstrate poor lip closure associated with hypotonia. Infants with cleft lip and palate frequently lack the structural requirements for good sucking.

Some children with feeding problems have abnormal oral-motor patterns which are rarely seen in normal children. Abnormal behaviors include: jaw thrusting, strong tongue thrusting, tonic bite reflex, lip retraction, tongue retraction, and nasal regurgitation (see the glossary). Other behaviors associated with feeding problems which may reflect delayed development or abnormal development include drooling, choking, and hypersensitivity.

Unlike normal children, children with feeding problems may not be able to "break out of" primitive or abnormal behavior patterns. They are not "free to choose."

SUMMARY

Through the process of growth, maturation, and learning, feeding is developed. A number of factors influence how well this skill is achieved. These factors were reviewed in the preceding text. Knowing what is normal in feeding is essential to understanding deviations. A basic knowledge of each stage of development determines the direction of remediation.

Feeding handicaps are complex. The underlying problem may be social-behavioral, intellectual, physical, nutritional, gross motor, fine motor, oral motor, or a problem in reflex development. The factors yielding a feeding problem may occur singly or together. When considering remediation, it serves little purpose to identify a single factor and work on it alone. Feeding problems are best solved through the interdisciplinary approach.

The interdisciplinary approach does not involve a departmentalization of knowledge. Instead it implies emphasis on a broadbased perspective. There is overlap and integration of the disciplines involved. With communication, the focus is on the entire spectrum, creating better understanding of each facet and more effective problem solving techniques.

The first stage in solving a problem is assessment of the situation. Assessment determines the point at which remediation can begin, and the direction in which it should proceed. As this section has presented the foundation for understanding what is expected for each stage of normal development, the next section will address the essentials of assessment.

PART II

Assessment of Areas Affecting Feeding

INTRODUCTION

Just as no one discipline alone can understand and provide all the answers to the normal feeding process, neither is any single health professional equipped to assess the feeding abilities and plan for the remedial program of a person with a feeding problem. Assessment implies a critical appraisal for the purpose of understanding or interpreting, or as a guide for taking action (Webster, 1966).

To assess a child or adult with a feeding problem, many areas are involved. Often there is overlap between them. A composite picture of the problem can be made by careful collection of information in each area, observation of the feeding process by examiners with different focuses, and compilation and distillation of the data gleaned by the health team.

To assist health professionals in both primary and tertiary care settings with the assessment of feeding problems, a comprehensive interdisciplinary Developmental Feeding Tool (DFT) has been developed and is presented in Appendix II. This part presents basic principles of assessment from each area defined on the tool; this section is to be read and used with the DFT.

SOCIAL AND BEHAVIORAL ASSESSMENT

A home visit provides a valuable observation of the child's life that cannot be seen in a clinic or other health setting. The visit can yield information regarding family lifestyle, events surrounding mealtime, and equipment available in the home. Success in remediation may hinge on the coping skills of the family. The known strengths can be utilized in planning followup care.

Tools such as the Richmond-Hopkins Family Coping Index and the Otto and Hill's Family Strengths Guide (Reinhardt-Quinn, 1977) reveal aspects of family functioning and relationships, thereby adding baseline data and credence to the feeding assessment. The HOME (Home Observation for Measurement of the Environment), (Powell, 1981), gives valuable information about the quality and quantity of social, emotional, and cognitive support available to the child at home. The natural interaction between the mother or caregiver and child is observed as it occurs spontaneously in the home environment.

Play may be considered the work of children and toys their tools. Toys such as rattles and strings of keys indicate the solitary play of the infant, while a truck, puzzle, or blocks are toys used in parallel play. Cooperative play is typified by two or more children playing with a ball or engaging in a game of hide-and-seek. Play stages overlap as the child matures. The mentally retarded child will, as in other activities, take longer to acquire advancing play skills.

A careful history is taken and behavioral observations are made during the interview/assessment when behavioral aberrations have been reported. Common self-abusive behaviors include head banging, biting, pinching, or hitting. Aggressive behaviors may be exhibited by hitting, biting, or otherwise hurting others.. Activity level—normal as well as hyperactive—requires evaluation. Some cues related to behavior may need further clarification: reports that the child is too quiet, excessively shy, sleeps too much, or always stays to himself. Excessive sibling rivalry, discipline problems, and overly affectionate behavior require investigation. One suggestion for recording inappropriate behavior is noting the action in the following sequence:

Antecedent	**Behavior**	**Consequence**
What happened before the act	The inappropriate behavior	What result did behavior bring to the child?
	Example	
Child at table at mealtime	Drooling	Mother wipes child's mouth and talks to her.

Such specific information as the antecedent, the behavior, and the consequences allows objective analysis and appropriate planning for remediation.

PHYSICAL ASSESSMENT

An assessment provides the information that a health care professional can use to gain an understanding of the etiology of a specific child's development, including handicapping conditions. Only after a proper assessment has been made can preventive efforts, treatment, and remedial plans be initiated, if necessary.

The physician is the team member who gleans indepth information concerning the physical growth and development of the child. This is done through a detailed history and a physical examination. A thorough review of all previous sources of information from hospitals, other physicians, and clinic records covers pre- and perinatal periods, status of the newborn, and postnatal factors as well as developmental milestones. The physical examination scrutinizes the structure, development, and functioning of the various body systems. From a head-to-toe study of a child, clues to the underlying nature of neurodevelopmental problems can be determined. Assessing health status includes measuring height and weight, monitoring vital signs, and reviewing the results of simple laboratory tests, such as hematocrit and hemoglobin.

Any infant or child with any aberration in feeding or growth should receive a complete examination prior to any remedial efforts. The crucial areas for assessment are included in the Developmental Feeding Tool (Appendix II).

There are a wide variety of technical tools available in the physical assessment of individuals to determine the integrity of the central nervous system, e.g., electroencephalogram, arteriogram, pneumoencephalogram, and computerized axial tomography (CAT) scan. These are usually performed under the direction and interpretation of a neurologist.

While carrying on a feeding program, measurements of growth should be made serially. One measure in isolation only provides an indication of size. The dimensions of growth—height, weight, and head circumference—are recommended for measurement by the American Academy of Pediatrics (Owen, 1973). The suggested frequency of measuring these factors are at birth, before newborn hospital discharge, and at 1,2,4,6, 18,24,30, and 36 months of age; thereafter, for normal individuals height and weight should be measured annually. For those with feeding and growth problems, the frequency of measurement is dependent upon individual needs. Procedures for measuring height, weight, and/or head circumference are outlined in three publications of the U.S. Department of Health and Human Services: *Nutritional Disorders of Children: Prevention, Screening, and Follow-up* by Samuel J. Fomon (1976); *Weighing and Measuring Children: A Training Manual for Supervisory Personnel* (1980); and *Nutritional Screening of Children: A Manual for Screening and Follow-up* (1981).

Laboratory studies are of great assistance in screening and follow up of children with feeding problems. A few laboratory tests should be carried out routinely. As a minimum, it is suggested that either hemoglobin concentration or hematocrit be performed. These determinations should be made with blood obtained directly from the fingertip or heel or from heparinized blood. Anemia is defined by Fomon (1976) as a condition in which hemoglobin concentration is less than 11.0 gm/100 ml in children below 10 years of age, or less than 12 gm/100 ml in older children or adolescents with the exception of males over 14 years of age. For this latter group a hemoglobin concentration less than 13.0 gm/100 ml is assumed to indicate anemia. Hematocrit values of 34, 37 and 41 correspond roughly to hemoglobin concentrations of 11, 12, and 13 gm/100 ml. If hemoglobin or hematocrit levels are low, it is important to determine whether anemia is associated with iron deficiency.

NUTRITIONAL ASSESSMENT

Assessment of the nutritional status of handicapped children is often difficult because of lack of standard criteria. Few data are available for determining their dietary needs, and standardized growth charts have not been developed. As a result, nutritional assessment utilizes the correlation of several parameters — clinical observation, nutrition history and dietary intake, feeding abilities, anthropometric measurements, and biochemical tests (Fomon 1976; Smith, 1976).

A physician or nurse usually conducts a cursory assessment of nutritional status in the course of a routine check up. In most clinics indepth nutrition assessments by a clinical nutritionist or registered dietitian are done only on a referral basis. Some tertiary care centers conduct nutritional assessments as a part of the routine evaluation on all patients. Criteria for referral of a child with a feeding problem to a nutritionist might include: a mechanical feeding problem, delay in developing feeding skills, inborn errors of metabolism, anemia, overweight/underweight, growth delay, excessive vomiting and/or diarrhea or constipation, delayed weaning, poor appetite, poor food habits, bizarre food habits, allergies, or other chronic problems resulting in limited or excessive food intake.

In a nutritional assessment of a child, the nutritionist usually interviews a caregiver to obtain a health and feeding history and current information. Observation of the actual feeding procedure is an integral part of the assessment. Patients, particularly small children, view this as a "fun" snack, not a test. A simple feeding tray is set up in a health care setting with foods to eat with a spoon/fork (diced peaches or other soft fruit), food to spread (peanut butter), finger foods (crackers), and a beverage (milk or juice). With these items, chewing, swallowing, tongue movement, and use of utensils can be observed. During the feeding assessment clinical observations can be made of the mouth, tongue, teeth, skin, eyes, nails, and hair. The assessor must understand manifestations of the clinical nutrition. The symptoms associated with malnutrition may easily be mistaken for poor oral hygiene, allergies, and exposure .

Besides the data gathered during the interview and feeding assessment, the dietary patterns of the patient are an integral part of the nutritional assessment. Although dietary intake assessment does not measure utilization of food, it serves as an important part of the total nutritional picture. There are several ways in which dietary intake information can be gathered.

Family food accounts describe food purchased. These include a food frequency checklist that gives the examiner clues as to how often certain foods are consumed. All basic foods are usually listed on the checklist. This method provides valuable data when used in combination with other methods. When used alone, at best it provides only qualitative data.

Food records describe the quantity of foods eaten over a period of time. Records of the types and amounts of foods and beverages eaten may be kept by a caregiver for one to seven days.

A 24-hour recall obtained during the nutrition interview is another example of a food record. The interviewer asks the caregiver to recall and report all foods and beverages consumed in the past 24 hours. If the past 24 hour's diet has been atypical, the caregiver is asked to recall a typical 24-hour intake. The written food record is more reliable than the 24-hour recall. Like the food frequency checklist, the food record does provide valuable data when used in combination with other methods of dietary assessment.

After the dietary information has been obtained, it must be evaluated. This may be done by a dietary scoring procedure using the food group approach or by calculation of nutrients. Nutrient calculation can be done by hand or through a computer using nutrient data banks. The data thus obtained are compared to the standard for dietary or nutrient recommendation, i.e., NRC-RDA or Five Food Groups.

Anthropometric assessment is one of the parameters that best measures nutritional status. Growth measurements should include height, weight, and skinfold. Few publications give procedures for weighing and measuring physically handicapped children who are nonambulatory. If these children have bony deformities and severe contractures that prevent their limbs and trunk from being straightened out for measuring linear growth, segmental measurement is necessary. Using a flexible metal tape, measure from joint to joint beginning at the bottom of the heel. Measurements should be made from bottom of foot to the ankle, the knee, the hip, the waist, to top of the shoulder, the neck, and then the head. Record each segmental measurement as it is made, and add all measurements for an approximate length. The length obtained is then plotted on standard growth charts for comparison. The accuracy of such measurement is questionable.

For weighing nonambulatory, physically-involved patients, commercially available sling-type balances are available (Fig. 12). If a balance cannot be obtained from a medical supply company, approximate weight can be determined by weighing the caregiver with and without the patient and subtracting the lower weight. Procedures for measuring skinfold are outlined in Fomon (1976).

Biochemical or laboratory tests are quantitative methods of assessing nutritional status. Individual tests can show how the body uses specific nutrients. However, without dietary intake information, it is difficult to interpret the biochemical tests. Laboratory results usually identify nutritional abnormalities before clinical signs of malnutrition occur. Biochemical indices detect marginal as well as long-standing nutritient deficiencies through nutrient levels and metabolic products in blood and urine. Biochemical tests are costly. The extent to which they are used in nutritional assessment depends on how crucial they are to the diagnosis and treatment of the patient. The least expensive tests are hemoglobin and hematocrit (Fomon, 1976).

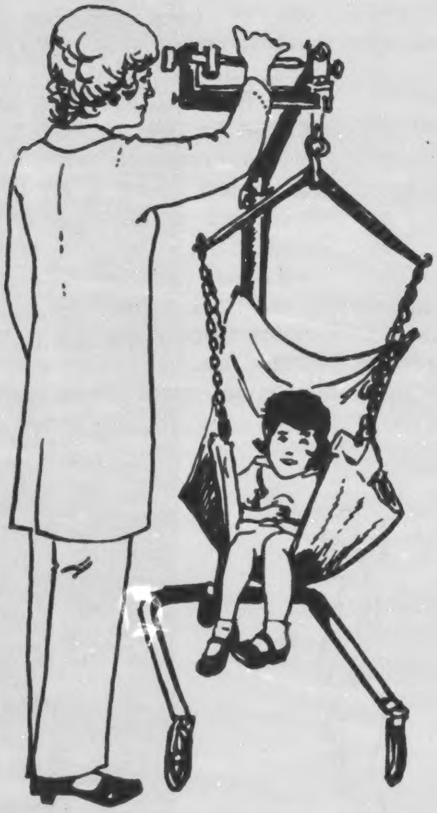

Figure 12. Hoyt Lift for weighing nonambulatory children and adult

REFLEX AND GROSS MOTOR ASSESSMENT

In assessing gross motor skills of the child with a suspected or confirmed handicap in relation to the feeding process, six areas are examined. The first area is muscle tone. An attempt must be made to determine whether the child has high tone, low tone or fluctuating tone, and how the tone is affected in a variety of positions. Secondly, assessment of range of motion as it relates to any difficulties the child might experience in sitting or in use of the arms during mealtime should be done.

Problems in body alignment should be examined next. Scoliosis, kyphosis, lordosis and/or subluxation or dislocation of the hips are of particular concern when proper positioning of the child is being considered (Fig. 13).

Reflex development is another area that should be assessed. Certain reflexes such as the asymmetrical tonic neck, symmetrical tonic neck, tonic labyrinthine, and protective responses in sitting are particularly noted since these reflexes exert influences on feeding skills.

Gross motor skills are examined as they relate to positioning at mealtimes. Head and trunk control are tested in a variety of positions such as prone, supine, and sitting. Rotational skills in all positions are also noted. The assessment of gross motor functioning in conjunction with other areas of assessment helps determine the best position for feeding as well as for remediation of problems of the child with a handicap.

Complete assessment of reflexes and gross motor skills are difficult to do and should be done by health professionals with special expertise such as physical and occupational therapists. Though the DFT addresses these areas in a cursory way, to confirm the diagnosis a referral should be made.

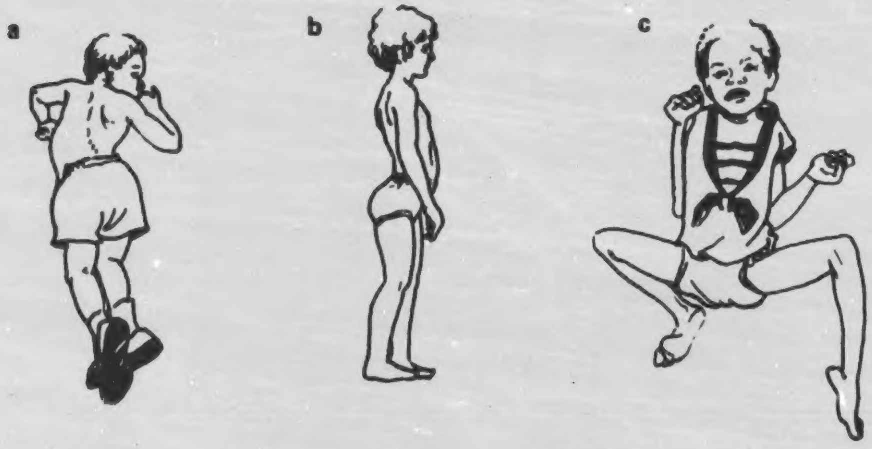

Figure 13. a - Scoliosis, b - Lordosis c - Dislocation of the hips

FINE MOTOR ASSESSMENT

Fine motor problems interfering with feeding may be manifested by upper extremity problems relating to prehension patterns and arm control, incoordination, limited range of motion, decreased muscle strength, or any combination of problems. Difficulty is typically seen among children with central nervous system damage, developmental delay, or some type of behavior problem. When onset of the damage is at or before birth or in early infancy, impaired sucking and swallowing patterns may be noted. As the child with problems grows (or when damage occurs later), there may be difficulty in controlling the head, trunk, and/or extremities.

Self-feeding is a complex process. Before beginning assessment or remediation, a review of readiness signs for independent feeding may be helpful. Readiness signs include (1) trunk control (2) use of upper extremities with good grasp and release (3) ability to chew, swallow, and cough (4) head control (5) knowledge of body parts and (6) awareness of the feeding situation. Attainment of these skills usually means that the child is ready for a training program, with the goal of independent feeding. Absence of readiness signs does not preclude feeding training, but probably indicates that the child is not ready to learn to feed himself. Remember, a feeding training program is based on a child's functional level, not the chronological age.

Assessment of abilities should focus on the functional level of fine motor development and the child's degree of awareness. The Gesell Developmental Scales (Gesell & Amatruda, 1974) serve as a tool to determine functional level of fine motor development. Direct observation reveals the child's curiosity about the food, imitation of others at mealtime, placing hands and toys in the mouth, and activity level when food is presented.

The Erhardt Developmental Prehension Assessment (EDPA) (Erhardt, 1981) provides a structured evaluation of prehension for children from birth to 15 months. The EDPA has a separate section to evaluate pencil grasp for children from one to six years. If the EDPA is not available, an occupational therapist may be able to suggest another fine motor evaluation tool.

Free or structured play provides excellent opportunities for informal assessment of toddlers, older children, and adolescents. The child should feel relaxed and be cooperative while being unaware that assessment is occurring. Writing and coloring reveal motor maturity. Type of grasp can be observed as the child is stacking blocks, putting them in a container, or transferring them from hand to hand. Reach, grasp, and release patterns are basic to refined hand skills developed for self-feeding. These play activities also provide keys to the child's self-awareness.

It is recommended that some of the assessment of fine motor skills take place while the child is eating. Informal assessment during a meal or snack is an appropriate way to gain information related to questions in the fine motor area. For example, how is the child positioned? Does the feeding position give security so upper extremities are used effectively? What type of grasp is used to pick up raisins or to hold a spoon? Which hand is used? Are reach, grasp, and release accomplished smoothly? Can the child pronate and supinate the hand? Does feeding ability improve with the use of adaptive equipment?

The information gathered in assessment of fine motor skills should, ideally, be combined with information from other developmental areas in order to plan a comprehensive program.

ORAL-MOTOR ASSESSMENT

In evaluating the adequacy of oral-motor development, the foreground behaviors are, naturally, the movements going on in and around the mouth. The oral-motor section of the Developmental Feeding Tool (Appendix II) is designed to focus on specific movements of the mouth before and during feeding. However, it is important to remember that oral-motor activity also involves such background factors as body positioning, fine and gross motor skills, social interactions, and cognitive level.

To assess the child's strengths and weaknesses in eating, the following areas of oral-motor activity should be considered:

1) General Observations (including Facial Expression and Respiration)

These items in the DFT should be used as a quick checklist as the evaluator establishes rapport with the child and prepares for feeding. Are the child's facial features symmetrical? In talking with the child and observing his facial movements, the evaluator should assess the general muscle tone of the lips and cheeks and the range of movements available to the child. Are the movements symmetrical? Is one lip drooping? In what ways does the child use the face to communicate nonverbally?

Efficient eating requires smooth coordination of sucking, swallowing, and breathing. Breathing should be assessed in an upright position whenever possible. Remove the child's outer clothing to get a good look at his breathing pattern. Does the child constantly breathe through his mouth? Does the child show movement of the upper chest during inhalation and exhalation, or is the movement predominately abdominal? Is there abnormal flaring of the ribs? Are the child's respirations rapid and shallow? Regular or irregular? Some general observations about the condition of the child's teeth and gums are also appropriate.

2) Oral Sensitivity

Some children with eating problems resist being approached for feeding because they are extremely, abnormally sensitive to tactile stimulation. They have not had normal sensory-motor experiences necessary for normal responses to touch. Other children demonstrate a lack of sensation in the oral area and have difficulty eating because they cannot feel in some part of theoral mechanism. A vital link in the feedback system necessary for coordinated oral movements is missing. Evaluation of reaction to touch outside the mouth as well as within the mouth is necessary.

3) Oral Reflexes

One goal of oral-motor assessment is to determine what factors control the way a child moves his mouth while eating. Normal children show a flexibility that allows reflex activities to be integrated with voluntary, cortically controlled movements. Children who have trouble eating do not always share the same freedom. Four kinds of oral reflexes should be assessed: gag, bite, rooting, and suck/swallow. Is the reflex present or absent? If it is present, does it represent normal or delayed development? Reflexes which persist beyond the normal period of time can delay the development of feeding skills. Some children also demonstrate abnormal reflexive activity, such as the hyperactive gag reflex and tonic bite reflex. These abnormal reflexes prevent the emergence of normal oral movements for eating.

4) Feeding Patterns

This section of the DFT is used to record observations while the child is eating or drinking. A checklist is provided to highlight assessment of lip function, jaw movement, and tongue activity in major eating behaviors such as sucking, cup drinking, swallowing, and chewing. The assessment should be done in a typical, comfortable feeding situation for the child. However, it may be necessary to set up ways to observe certain behaviors. For example, the evaluator may choose to smear a little pudding on the child's lips to see whether he can use his tongue adequately to clear food from his lips.

These observations of feeding patterns will later be used to design a developmental hierachy for improving oral-motor skills. For example, a child who cannot move food from one side of his mouth to the other may first need practice in lateralizing his tongue when food is placed between his teeth by someone else.

There is also a section for evaluating isolated lip and tongue movements at the imitative level. It is important to compare vegetative function with voluntary oral movements, in order to assess the child's ability to plan and execute specific oral movements when he chooses.

5) Special Problems

Certain behaviors associated with feeding need special attention and may require indepth observation. A few such problems are outlined in the DFT: drooling, abnormally strong tongue thrusting, and clefts of the lip and palate.

The comments section should be especially useful for describing special problems. For example, it is important to note specific factors that contribute to the drooling problem of a given child. Consider the following possible influences: posture, physical activity, poor lip closure, swallowing problems, attention seeking, sensory deficits, and specific foods.

There is some controversy about the definition of a true tongue thrust problem. Evans-Morris (1977) defines tongue thrusting as the forceful protrusion of the tongue from the mouth. Abnormal tongue thrusting should be differentiated from suckling, which aslo involves in-out movement of the tongue. In suckling emphasis is on the in-phase of tongue movement in a rhythmical in-out pattern. In abnormal tongue thrusting, the out-phase of the tongue movement predominates. This strong forward thrusting may be observed during bottle-feeding, cup-drinking, chewing, and/or swallowing. Tongue thrusting becomes a problem when it interferes with any part of the feeding process.

The emphasis in oral-motor assessment is ongoing observation of feeding behaviors within the framework of the child's overall development. The goal is to determine which behaviors are normal and which behaviors represent delayed or abnormal development that interferes with successful eating.

PART III

Remediation of Feeding Problems

INTRODUCTION

After assessment comes the plan of care that is the roadmap for solving or remediating the feeding problem. Remediation is an ongoing process. As progress is made, goals are changed or modified, and the procedure continues until the problem is solved.

Assessment and reassessment are continually repeated in the remedial process. These procedures occur formally and informally. As the caregiver follows the care plan, subtle or obvious changes are noted daily. These observations affect the caregiver's expectations of the child. As therapy is given and the team monitor observes the child and discusses the care with the caregiver, the appropriateness of the program is judged and priorities are set and reset. Informal observations prompt reassessment by some or all of the team and the process continues.

As in assessing feeding problems, remediating them also requires the knowledge and skills of many health professionals working together. The team composition for remediation should be decided upon by the needs of the child, not by availability of professional staff. The diagnosis and plan of care may be done at primary care level. Or a child with severe problems may be sent to a tertiary care center for diagnosis. Even when an evaluation is done in a tertiary care setting by a myriad of health professionals, remediation often occurs on the local scene with few health providers available to carry out the program. Plans of care should be thorough and comprehensive, but they must be practical and usable.

Part III deals with remediation strategies for feeding problems including the basic techniques of oral facilitation, adaptive equipment, behavior management, diet/drug interactions, nutrition therapy, and positioning techniques. Case studies are presented as examples of the interdisciplinary approach to remediation of feeding problems.

BEHAVIOR PROBLEMS

Behavior problems occur with normal as well as handicapped children. While most parents have no difficulty in dealing with normal children who refuse food, the parents of handicapped children who do the same thing are often uncertain about what they can or should do. Even if they know what to do, many have trouble in carrying out a program because of their feelings toward the child (pity, guilt that may lead to overindulgence, difficulty in setting limits on behavior, etc.). This problem is compounded when the child is on a special diet, such as those required in phenylketonuria (PKU), diabetes, and allergies.

In essence, behavior problems are problems in teaching and learning. The basic principles of learning are the same for handicapped and nonhandicapped children:

1. Children tend to do what gets rewarded – that is, what is pleasant. Rewards can be different for different people. One of the most powerful rewards for most children is attention from other people, particularly adults.
2. Conversely, children tend not to do what is followed by unpleasant consequences. Again, since attention is very rewarding to most people, withdrawal of attention is very unpleasant.

Consistency is imperative in applying and withholding rewards including attention.

Mealtime is a social occasion, so a great deal of attention is given to each person by the others. This provides an opportunity to use attention to change behavior. However, the main rewards of eating should not be overlooked: reduction of hunger and gratification from food.

Most behavior, including mealtime behavior, is complex and differs among individuals. However, complex behavior can be broken down into simpler parts and the basic principles applied to change these parts. When the parts change, so does the whole.

Mentally retarded children learn more slowly than normal children and are less able to generalize what they learn from one situation to another; therefore, special attention needs to be given to consistency when working with them. The principles of learning, though, are the same. Physically handicapped children learn the same way as other children but have more limits on the use of their bodies.

Even normal children regress during stressful periods such as illness, death or divorce in the family, or moving to a new home. Handicapped children are no different, but they often take longer to regain lost skills. This must be taken into consideration in planning and carrying out a feeding program.

It is especially important to remember that in the vast majority of cases, parents will be the "therapists." Their emotional needs must be understood. Allowances may have to be made for their family situations and programs may have to be redesigned to meet parental objections. When parents are intellectually limited (retarded children grow up to be retarded adults who often have children of their own), steps must be kept simple and a great deal of guidance and praise must be given. Even very bright, well-educated parents need praise. The main reward for all parents, however, is seeing their efforts succeed.

Very complex problems in feeding, such as anorexia nervosa, are best left to a team of specialists, usually in a hospital. Gross obesity is another complicated problem that usually requires consultation with a nutritionist, a physician, a nurse, and often a psychologist or psychiatrist.

For further information about principles of learning and behavior problems associated with feeding, see Deibert and Harmon (1973); Patterson & Gullion (1968); Patterson (1975); and Wright, Schaefer and Solomons (1979).

DRUGS AND DIET

Drugs are frequently used in children with developmental problems to prevent or control seizures or convulsions (e.g., diphenylhydantoin [Dilantin] and phenobarbital); to stimulate the central nervous system (e.g., methylphenidate [Ritalin] and dextroamphetamine [Dexedrine]); as tranquilizers, (e.g., phenothiazine [Thorazine] and thioridazine [Mellaril]); and antidepressants (e.g., amitripyline [Elavil], imipramine [Tofranil], and phenelzine [Nardil]); and to treat inborn errors of metabolism and to modify symptoms in learning disabilities (e.g., pyridoxine and niacin) (Springer & Fricke, 1975). Recognition of interactions between drugs as well as the adverse effects drugs sometimes have on the nutritional status of handicapped children and adults must be considered in planning for care. A review of all medications and supplements a patient is taking should be a part of every assessment. The prescription of many drugs at one time (polypharmacy) may result in other diseases and conditions unrelated to the handicapping condition.

The most commonly prescribed medications for the handicapped include stimulants and anticonvulsants. Stimulant drugs (dextroamphetamine and methylphenidate) used to control undesirable behavior in hyperactive children may adversely affect their growth (Lucas & Sells, 1977). Anticonvulsant therapy (phenobarbital, phenytoin, diphenyldantoin, and primidone, alone or in various combinations) may result in bone disease resembling vitamin D deficiency: osteomalacia in adults and rickets in children (Kenny, 1979). Anticonvulsants may also result in folate deficiency and megaloblastic anemias, while folic acid supplementation may cause increased seizure activity (Roe, 1977).

In management of handicapped individuals, team recognition of the untoward effects of drugs as well as periodic review of medication, hematological levels, and biochemical tests must be a part of the plan of care. Polypharmacy can be prevented by periodic review of all medications by the health team with adjustments for follow-up. Specific consideration should be given to patients on stimulant or anticonvulsant therapy as outlined.

1) Stimulants

   Children on stimulants should be monitored regularly while care is given to provide a diet abundant in calorically dense foods, since appetites are often depressed and the total quantity of food consumed is low. Monitoring should include nutritional and physical reassessments with particular attention to anthropometry and nutritional intake.

2) Anticonvulsants

   Prior to initiation of drug therapy, serum folate, vitamin B_{12}, hematological profiles and other chemistries should be done when indicated; during treatment, these profiles should be repeated at regular intervals. Folic acid supplements should be managed carefully to insure an adequate dietary intake. Dosage should be as low as possible, but high enough to overcome increased needs induced by the drugs.

   Persons on anticonvulsant drugs may be treated prophylactically with vitamin D; however, there is some question as to the response of anticonvulsant-induced rickets to routine vitamin D supplementation. In cases of known rickets, 25-hydroxycholecalciferol appears more effective than other analogs of vitamin D in reversing problem (Lifschitz & MacLauren, 1973, and Roe, 1977). Care should be given to insure an adequate dietary intake of vitamin D for all persons on anticonvulsant medication.

Many other drugs are taken by the handicapped. Appendix V describes the food/drug interrelations of some commonly used medications. In addition to the factors considered in the table, team members must remember that the effectiveness of drug treatment is influenced by the types of foods eaten, the timing of the medication in relation to meals, the types of drugs taken in combination, and the dosage levels. Although a treatment regime is carefully planned, its effectiveness can be seriously impaired and dangerous side effects can occur if careful instruction on when and how to take medications is not provided.

NUTRITION

To remediate feeding problems affecting the nutritional status of children, it is helpful to categorize the problem areas. Most feeding problems seem to fall into four general categories: mechanical feeding difficulties, feeding skill difficulties, behavioral problems, and disorders requiring diet therapy.

Mechanical Feeding Difficulties

This category includes oral-motor problems that interfere with normal ingestion of foods. Children with these problems are often profoundly retarded, have severe neurological or physical defects or both. They cannot swallow well or chew. The potential for overcoming the problem is usually quite limited.

The nutrition remediation goal for this group is to insure an adequate food intake. It is necessary to modify the consistency of the food offered and continue oral feeding if at all possible. Since people live for many years with these conditions, it is important to keep the food and feeding process as normal as possible. Foods can be blended separately and served on a compartment-type of plate so that different flavors can be offered.

Pureed food that has been thickened slightly with cooked whole grain cereal or bread is easier for severely orally impaired individuals to swallow than thin liquids. The feeding process is lengthy and positioning to maximize intake is crucial. Careful attention to quantity and quality of the intake is very important. Frequent dietary analysis and measurements of weight to assure growth and maintenance are necessary for monitoring. If adequate energy and protein cannot be provided with the pureed diet, supplements should be given. Several of those are listed in Appendix IV.

Some patients with neurological deficits cannot take any food by mouth, thus necessitating tube feeding. Many kinds of preparations for tube feedings are currently available; complete discussions of their formulations are found in local diet manuals and textbooks of therapeutic nutrition. Any decision to use a tube feeding should be carefully considered. Neither nasogastric nor gastrostomy tube feeding should be used as an "easy out" for feeding if food can be provided orally through proper facilitation. A tube feeding prescription is not static, but needs to be modified often, particularly in children, to meet their increasing energy and nutrient requirements. When tube feeding is abused, the patient may become totally dependent upon this method and never become an independent eater. Orally impaired children who have a strong tongue thrust or abnormal gag reflex are not appropriate candidates for nasogastric tubes. Tubes may be difficult to insert in these children, and the reflexes triggered may contribute to aspiration.

Total parenteral nutrition (TPN) is an alternative method to be used only when people cannot be fed by mouth or digestive tract. Intravenous, intramuscular, or subcutaneous infusions can supply total nutritional support. Though not often used in handicapped children, this feeding method is available for conditions like malabsorption, cancer, bowel obstruction, ulcer, fistula, chronic diarrhea and vomiting, ulcerative colitis, congenital anomaly, failure to thrive, acute renal failure, and inflammatory bowel disease.

Parenteral feeding is not a routine method of diet therapy. It is expensive, time consuming, and requires the expertise of a health care team generally composed of a physician, nurse, registered dietitian, and pharmacist to achieve the goals of therapy. Surgery is involved to insert the support line in the patient. The patient's nutritional status including height and weight must be monitored daily as well as any signs of infection, the function of the pump infusing the feeding, and the patient's progress. The role of the dietitian is to provide information to the team about nutrient needs, composition, and past nutritional habits for better understanding of the patient's nutritional status. If the patient is sent home on TPN, the dietitian should assist in patient education.

Very sophisticated TPN feeding regimens have been developed commercially to meet patients' needs. In past years most feedings were formulated in the hospital pharmacy. Regardless of which type of feeding is used, the team should develop strict protocols for the use of TPN solutions, and each product should be evaluated by the team to meet individual needs. Guidelines and criteria to begin total parenteral feeding have been developed (Abbott, 1980).

Some children with oral-motor problems can improve; others cannot. As swallowing improves, chewing may be learned. The goal

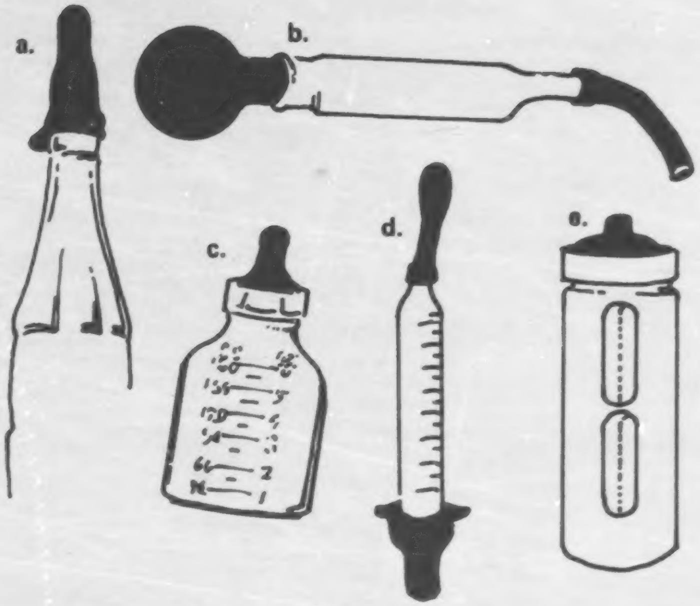

Figure 14. Types of feeders: a - lamb's nipple, b - bulb syringe, c - cleft palate nurser, d - Brecht feeder, e - plastic nursing bottle with disposable insert

for the nutritional remediation is to increase the consistency of the diet as abilities improve. The progression from pureed food to finely chopped food to coarsely chopped food to table food should be made as rapidly as possible with each patient. Behavior management techniques, physical and occupational therapy, and combinations of these approaches have been quite helpful to many children in facilitating oral-motor function.

Another group of children with mechanical feeding difficulties are those with craniofacial anomalies affecting the lips and mouth, e.g., cleft palate and lip. These children may have grave feeding problems, the severity depending to some degree upon the type and extent of the defect. Clefting of the lip may be unilateral or bilateral; that of the palate may range from a very minimal "notching" of the uvula, to complete absence of both the soft and hard palate. In the latter cases, infants are unable to create negative pressure needed for sucking. Of necessity, they learn to chew or squeeze the nipple or feeding appliance to satisfy hunger. Milk or formula are frequently aspirated and severe infections occur.

The goal of the nutritionist/dietitian in this situation is to assist the mother in finding the best possible method for feeding the infant. Various types of feeders are commercially available and other conventional feeding tools can be modified (Fig. 14). Some include the lamb's nipple fitted over a pop bottle, the bulb syringe, a special cleft palate nurser produced commercially by Mead Johnson Company, the Brecht feeder, and the plastic nursing bottle with disposable inserts manufactured by Playtex. In feeding, the liquid is directed to the side and back of the tongue to prevent choking and aspiration. Several methods may be tried with each infant before one is chosen. The one selected should be the easiest to use, and the one with which the caregiver is most comfortable.

The feeding process is slow and very frustrating for both the infant and the anxious caregivers. Frequent burping is usually necessary since excessive air is swallowed. The intake may be very small and a more concentrated formula may be recommended cautiously since care must be given not to exceed the renal solute load. Monitoring of the intake and growth is important.

In large medical centers, obturators – dental appliances that fit in the roof of the mouth – are often made for infants with severe clefts of the palate. A maxillofacial prosthodontist can fabricate the appliance. It seals the opening, assists in the feeding process, and maintains the palatal segments in proper relationship. Modification of the appliance is necessary periodically to accommodate growth of the upper jaw.

Surgical repair of the lip defect is usually accomplished as soon as the infant's physical condition permits. Palatal surgery usually is deferred until about 18 to 24 months of age.

Formula for the infant should be the same as for any infant. Breast feeding may be mechanically impossible; if so, fortified formula is recommended. Foods should be introduced at usual ages, and textures should be offered as with any infant. Spoon feeding and cup drinking should be encouraged, beginning at nine to twelve months.

Though some cleft palate children have some degree of mental retardation, most are not retarded. The height and weight of cleft palate children tend to be low if they are not managed correctly.

Feeding Skill Difficulties

Feeding skill difficulties involve the inability to self-feed with either the hands or utensils. Many children are unable to bring hands to mouth. They do not understand the complex manipulations required to use utensils. As a result, they must be fed. Their nutritional status often suffers. Self-feeding is one of the most important skills to be acquired by handicapped children, whether institutionalized or not.

The goal of nutrition intervention in remediating feeding skill difficulties is to assist in planning diets that are the easiest for the patients to eat and still meet their nutritional needs, i.e., strips and slices of foods for finger feeding; mashed foods for spoon feeding; larger pieces of food for fork usage. Behavior management techniques have been quite effective in teaching skills. Attention should be given to the kinds of food reinforcers used. If mini-meals are used to increase practice time for self-feeding, care should be given to insure that the daily intake of all meals meets but does not exceed the nutritional needs of the child. Monitoring of intake, height, and weight provide the basis for continued programming.

Behavioral Problems

Nutrition intervention may be indicated when a child exhibits problems with food acceptance and mealtime behavior, pica, rumination, anorexia nervosa, and therapeutic diets for behavioral treatment. The type of foods eaten by handicapped children and their mealtime behaviors have received very little attention. Often these children will eat only three or four preferred foods and refuse to taste any others. Sometimes they have tantrums or pour out their food. As a result, the diets of these children are nutritionally poor, and the caretakers are frustrated. The goal of nutrition remediation is to improve the variety of foods accepted in the diet and eliminate the undesired behaviors at mealtime. Health professionals using behavior modification techniques can reinforce the acceptance of nonpreferred foods and introduce overcorrection techniques to eliminate the undesired behaviors. The procedures must be carried out consistently over a period of time. Dietary intake and growth must be monitored throughout the program.

The same techniques can be used in the case of pica. This is a condition in which nonedible substances are consumed at the expense of foods, and nutritional deficits result. It is not clear whether the individual is able to discriminate edible from nonedible substances or if such information is ignored. In some cases, where the ability to make such discriminations is obvious, the individual may indicate a preference for the nonedible substance.

Another behavioral problem less frequently encountered is rumination. This disorder can occur at any age, and the cause is not understood. It involves regurgitating food and reswallowing. Children with the disorder appear to be ravenous and eat large quantities of food; yet, they are quite small. The goal of nutrition intervention is to provide an adequate diet, to try to extinguish the behavior, and to promote growth. Behavioral management techniques have been used to effectively treat this condition in some cases. Gorging the child on a favorite food has also been used effectively.

Anorexia nervosa does occur in handicapped children during adolescence. This is a very serious nervous disorder in which the food intake is greatly reduced, the individual becomes emaciated, and death may result. The goal of intervention is to improve the appetite and dietary intake and promote weight gain and health. Behavioral or psychiatric therapy is the treatment of choice, but attention must be given to monitoring food intake and growth. If feeding by mouth is not possible, tube feeding may be used as a temporary measure.

In recent years nutrition intervention has been suggested for the treatment of hyperactivity and learning disabilities. The K-P diet was developed by Dr. Ben Feingold for this purpose in 1974. This diet eliminates food additives and salicylates in an effort to treat hyperactivity and learning disabilities. Although the approach has received much publicity, it remains controversial, and the claims of dramatic responses in large numbers of children made by Feingold have yet to be substantiated (Nutrition Foundation, 1980).

Megavitamin therapy, another controversial form of nutritional care, has been reported to help in ameliorating hyperactivity, learning disabilities, emotional disturbances, and epilepsy in children. Biotin, niacin, pyridoxine, ascorbic acid, vitamin E, thiamin, and vitamin B_{12} have been used. This therapy is based on Linus Pauling's thesis that mental and behavioral disorders can be remediated through huge doses of vitamins. Double-blind studies have not substantiated the benefits of this hypothesis. Some side effects of the treatment have been documented – megadoses of niacin causing flushing, increased uric acid levels, nervous reactions, decreased glucose tolerance, and hyperpigmentation; fat soluble vitamin toxicity; and complications from excessive water-soluble vitamins (Palmer and Ekvall, 1978).

Disorders Requiring Diet Therapy

Disorders common to handicapped children requiring nutritional intervention include underweight, overweight, anemia, inborn errors of metabolism, and seizures.

Underweight and overweight occur commonly among children and adults. They result from an imbalance between energy intake and energy expenditure. Volumes have been written on remediating these problems. For this publication, only a discussion of treatment specifically for the handicapped is included.

The precise reason a neurologically impaired child is severely underweight is often not clearly understood because of the difficulty in determining caloric need and energy expenditure. Although many of these individuals are immobile, they make many unpurposeful movements that require energy. The National Center for Health Statistics Growth Charts (NCHS, 1980) provide a means for evaluating weight of children and adolescents; however, these were not developed for severely involved handicapped children. In a weight management regime, it is important to establish some level of basal caloric requirement. Data published by Beal (1970) provide narrow age ranges for kilocalories per centimeter of height and are useful in establishing an approximate kilocaloric level.

The goal of the weight management program is to normalize weight in proportion to height. In underweight children the goal is to increase kilocalories above the minimal level needed for growth and maintenance to promote weight gain. In overweight children the goal is to maintain adequate kilocalories for linear growth and maintenance, while allowing no weight gain until weight is proportionate to height. Thus, the usefulness of the NCHS Growth Charts in monitoring a weight management program for handicapped children is apparent. Interdisciplinary weight management teams have been effective in treating these problems.

The treatment of anemia in handicapped children is the same as for normal children. When the type of anemia has been determined to be iron-deficiency, foods high in iron should be included in the diet. If the deficiency is severe, iron preparations should be prescribed by the physician. Monitoring of dietary intake and hemoglobin and hematocrit are important aspects of care.

The most common inborn errors of metabolism in handicapped children are phenylketonuria (PKU), galactosemia, and maple syrup urine disease (MSUD). An interdisciplinary team approach to treatment has been successful. The goal of the nutrition therapy for patients with these disorders is to provide an adequate diet while limiting the nutrient which cannot be metabolized. For PKU, the nutrient is phenylalanine; for galactosemia, galactose; and for MSUD, leucine, isoleucine, and valine. Since the limited nutrient is required in some instances for normal growth and development, the amount provided must be sufficient without exceeding the body's ability to use it. Thus, careful monitoring of dietary intake, biochemical parameters, and growth are essential.

Intractable and/or minor motor seizures in children may be treated by a ketogenic diet. The goal of this high fat diet therapy is to produce anticonvulsant action by increasing the number of ketone bodies through incomplete oxidation of fatty acids. Although the mechanism for reducing seizure activity by this means is not clearly understood, the method has been found effective for some children under eight years of age (Robinson, 1977).

The team approach is recommended for the effective management of any type of diet therapy, since meeting the nutritional needs always involves coordination. As previously stated, disciplines represented on feeding team may vary according to the type of facility and the type of problem.

A therapeutic diet requires a prescription from a physician. The diet prescription is filled by a nutritionist or a dietitian. This is a specialist uniquely trained to plan and direct nutritional care. Because remediation of feeding problems is an interdisciplinary process best managed through varied input, the nutritionist/dietitian should have an understanding of the problem and ability to communicate with all team members.

The feeding team, regardless of disciplines, should understand more than the physiological needs in diet therapy. Food is a very personal thing for all. Infants, children, and adolescents should be treated as individuals, with respect given for specific needs and preferences. Each individual who is able to understand deserves to know the rationale for dietary treatment, and what the feeding team expects. Involvement of the child and mother in programming is recommended whether it is manual guidance for feeding training or food selection. Nutrition education should recognize other factors that influence the acceptance of a modified diet (e.g., mealtime environment, emotions, food appearances, and family interactions). Basic nutritional counseling is a most important part of the intervention strategy. Such counseling should be tailored to the specific needs of the handicapped child and the family.

GROSS MOTOR SKILLS, FINE MOTOR SKILLS, AND REFLEXES

Children with physical disabilities are frequently unable to do what seem to be simple activities. Grasping a spoon or holding a glass may be difficult or impossible for the child with limited reach, grasp, or release. Some children may not be able to sit independently in a chair. Selecting appropriate adaptive equipment or altering existing equipment often greatly increases the child's level of independence. This section will address the equipment related to positioning and eating utensils.

Several basic principles apply to any adaptation, whether for seating or eating. First, individual evaluations should be completed on each child before any equipment is adapted. Second, no adaptation is as good as normal; therefore, great caution should be taken in not overadapting or providing too many gadgets that complicate the lives of the child or the family. Third, any adaptation should take advantage of the abilities of the child without limiting possible development. Last, cost and durability are important. The cost of materials and time for construction versus purchasing commercially available items must be considered.

SEATING

Adaptive equipment for seating can include car seats, bath seats, seats for play or school, toilet seats, and seats for eating. This section will focus on seating for eating.

Proper positioning is critical for independent feeding as well as for the child that must be fed. A proper position frees the hands of the self-feeder and prevents choking or aspiration of food in the child who is being fed. Positioning is very individualized, and each child will need to be thoroughly and individually evaluated in order to determine the best position.

Although individualized, there are certain objectives of adaptive seating that are common to a variety of children.

1) Any adaptive seating should encourage continued motor development. For example, if the child has limited head control, the adaptive chair may provide some head support; this allows the use of present head control, while additional control is developed.

2) The seating position should help to prevent or slow down any contractures or deformities. Although adaptive chairs do not replace such orthopedic devices as braces, they can help prevent orthopedic problems like curvature of the spine. Adaptive chairs should not create further problems (e.g., spina bifida children who have decreased sensation and may be unaware of pressure areas).

3) Adaptive chairs should help control any abnormal reflex activity. For the child with a persistent ATNR, the seating position should maintain the head in midline in order to facilitate finger and spoon feeding. As an additional example, if a child's feet are positioned properly on a foot support, the positive support reflex can be inhibited, and overall extensor tone in the child can be decreased.

4) The chair should provide safe and secure seating. If the child is insecure, good posture and participation in feeding are difficult to maintain.

5) Ideally, the chair should be one that can be easily altered. This is necessary for two reasons: a) as the child develops and gains more control, the adaptations can be reduced, and b) as the child grows, the chair can be modified.

In relation to areas of the body, there are some common factors especially important to seating and feeding (Fig. 15).

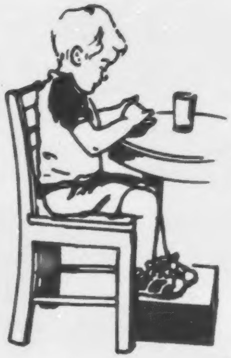

Figure 15. Proper seating position

1) Head and Neck. The head should be slightly flexed or brought forward. Swallowing is extremely difficult if the head is tilted backward. Tilting the head back creates the possibility that food can be aspirated. The "birdfeeding" position is never acceptable.

2) Trunk. The trunk should be more or less vertical to minimize the effort of stabilizing musculature, facilitate breathing, and provide maximum stability. There should be no hyperextension of the trunk and no lateral deviation.

3) Shoulders and Arms. The shoulders and arms should be brought slightly forward. This position helps prevent hyperextension and makes possible the use of arms and hands in feeding.

4) Elbows. Elbows should be level with the table top or tray surface. This position avoids tension on the shoulders and allows the eyes, arms, and hands to be in proper relation to the table when eating.

5) Hips and Knees. The hips and knees should be flexed to 90 degrees, preventing the abnormal hyperextension pattern. The front edge of the chair should not press into the back of the thigh.

6) Ankles and Feet. The ankles should be flexed to 90 degrees and the feet supported on a flat surface. A foot rest prevents wasted pressure on the back of the thigh.

A child's particular handicap or diagnosed condition certainly relates to difficulty sitting in an ordinary chair. Some examples follow:

1) The child with cerebral palsy or increased tone in the trunk and lower extremities may need a seat over a roll (Fig. 16). This seat, designed by Nancie R. Finnie (1975), keeps the knees and thighs apart and allows the feet to be flat on the floor. Several variations of this chair are commercially available, some of which incorporate the use of a table top and/or wheels.

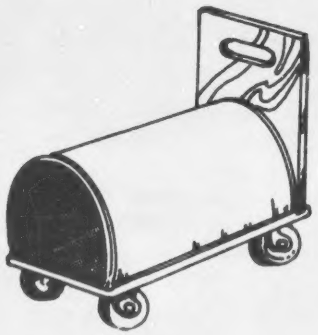

Figure 16. Roll seat

2) The child who is hypotonic with limited head or trunk control will fold over if not given adequate support. This child might be helped by special straps made of broad webbing or of toweling, which may be tied or fastened in the back of the chair.

3) The child with spina bifida will often require the use of the arms or hands to maintain an upright position. However, when attempting to self-feed, this child may slump forward, compressing the internal organs and preventing proper lung expansion. Sufficient trunk support is necessary to allow an upright position with the use of the hands.

4) The child in a plaster cast for congenital dislocation of the hip or a fractured leg will have great difficulty sitting in an ordinary chair. This child will probably need special adaptations to allow adequate support in a chair without putting pressure on the cast or thighs.

Several of the handicaps discussed relate to the Neurodevelopmental Treatment (NDT) approach of Bobath and Bobath, (1975). The roll seat designed by Finnie (1975) incorporates inhibition of abnormal postural patterns and promotion of normal postural reactions, two key principles in the NDT approach. The occupational, physical, or speech therapist using neurodevelopmental treatment techniques must know the approach thoroughly. Some therapists have completed a certification course in this treatment approach.

No matter what the solution to the seating problem, the ultimate aim is to approximate normal positioning. It is important to keep in mind that no chair is comfortable or appropriate for anyone for extended periods of time. The nonhandicapped move from chair to chair and from position to position, and so should the handicapped child.

EATING UTENSILS

Before recommending special eating utensils, evaluation of the child's skills and performance level is critical. Remember that the child's functional level, not the chronological age, is the key. If the child is not at the functional stage for self-feeding, no adapted or special eating equipment will make self-feeding possible.

Adaptations of feeding utensils need not be fancy, but do need to be functional. If the adaptation does not make the task easier or the child more functional, there is little reason to have the adapted equipment. Consultation with an occupational therapist will provide the best information about use of adapted eating equipment.

A variety of commercially adapted eating equipment is available. However, some inexpensive, temporary adaptations may provide the clues to whether or not commercial equipment will be of assistance to the child. Adapted equipment for feeding will be discussed in the categories of spoons and forks, plates and plate guards, and cups and cup holders.

1) Spoons and Forks. Typical adaptations to spoons and forks involve increasing the size of the handle, changing the angle of the spoon, the spoon bowl, or providing an external source for holding onto the utensil. One temporary method is wrapping the handle with a towel or masking tape to see if the increased size helps; use of bicycle grips is another temporary means of increasing handle size. To change the angle of the spoon, an old spoon can be bent with pliers, drilled, put into a wooden dowel rod, and angled with a wing nut and bolt (Fig. 17a). An external source for holding the utensil can be created from a clean plastic bleach or detergent bottle which can form a band to hold the utensil handle (Fig. 17b). A cuff made of elastic and leather with a pocket in which to insert the utensil handle can be made inexpensively (Fig. 17c). There are many adapted spoons and forks that can be purchased commercially; however, the greatest of care should be taken to evaluate the child properly, since purchasing equipment may not help.

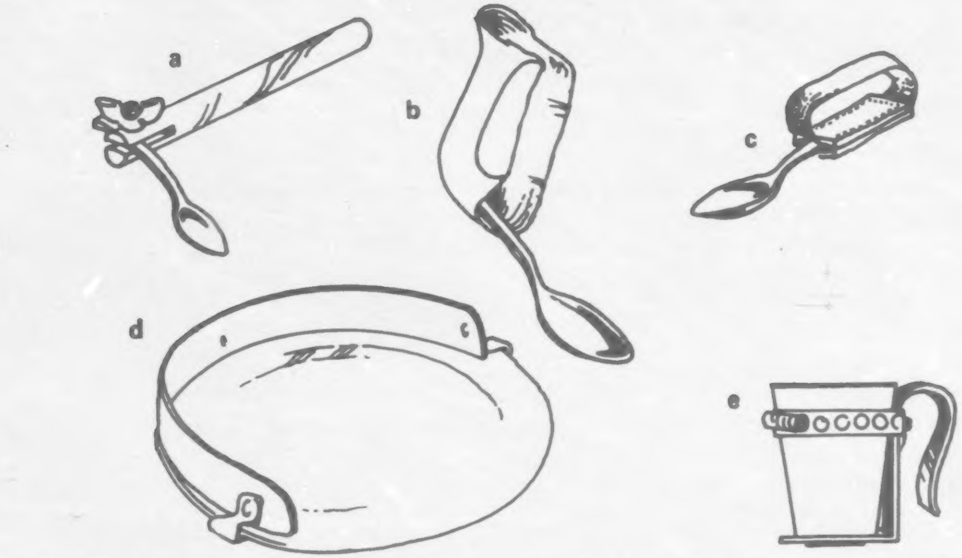

Figure 17. Adaptive equipment: a - angled spoon, b - bleach bottle utensil holder, c - leather with elastic utensil holder, d - plate guard, e - cup holder

2) Plates and Plate Guards. Adaptations to plates and use of plate guards typically have to do with stabilizing the plate or bowl to prevent slipping as the person eats or to build up the edges to provide a pushing surface for filling the spoon or fork. These adaptations are frequently used where there is the use of only one hand. For stabilizing the plate or bowl, an inexpensive method is to place a wet washcloth or sponge under the plate or bowl. Plates with rubber pads or suction cups attached may also work well; they are commercially available, as are plates with raised edges. Before purchasing a

plate-guard, try using a cake pan that is stabilized on the table. This will give an idea of whether or not the child can scoop against a raised edge for more independent eating. A plate guard (Fig. 17d) can be metal or plastic, and can attach to any household plate.

3) Cups and Cup Holders. Adaptations to cups stabilize the cup and hold it when there is insufficient grasp but good hand to mouth pattern. For children unable to lift a cup for drinking, cup stabilization might be accomplished by making a wooden box around the cup. This prevents the cup from tipping or falling over during straw drinking. Holders similar in concept to those used for utensils are made in which there is a metal band circling the cup and looping over the hand (Fig. 17e).

As stated previously, adaptations to feeding equipment need to be functional. If the adapted equipment does not make the person more independent, there is no reason to use it. It should also be remembered that if a person does accept and use this equipment, it must be taken to meals with friends and family, or to restaurants. If regular or ordinary equipment and utensils work just as well, the ordinary ones should be chosen.

ORAL-MOTOR SKILLS

When the Developmental Feeding Tool has been completed, the caretaker may feel overwhelmed by a huge amount of information about a given child's strengths and weaknesses in oral-motor functioning. The major question becomes: "Where do I begin?" In order to be useful, the information obtained through assessment must be arranged in a hierarchy of steps toward each major goal. For example, if a child has trouble chewing, the caretaker must determine which components of chewing (jaw movement, lip activity, tongue function) need improvement.

Knowledge of the normal, orderly pattern of oral-motor development provides the framework for planning treatment. As with assessment, the basic premise is that early developing oral-motor skills serve as building blocks or prerequisites for more refined eating behaviors. The following examples have been taken from articles by Suzanne Evans-Morris (1977). They demonstrate a rationale for treatment based on the normal developmental steps involved in bottle and cup drinking, spoon feeding, and chewing.

1) In the normal child the transition from suckling to sucking movements of the tongue is associated with an increase in activity of the lips. Improved lip closure appears to aid the build-up of negative air pressure of the mouth, so that the child takes in liquids easily. The in-out movements of the tongue are no longer necessary. Therefore, if the feeding assessment reveals that a suckling tongue pattern persists during eating, it may be necessary to focus on improved lip activity first. More mature up-down suckling movements of the tongue may be facilitated by improved lip closure.

2) Efficient cup drinking in the normal infant appears to be related to a gradual increase in jaw stabilization. Jaw stabilization seems to encourage more refined, independent movements of the lips and tongue. Therefore, a child who has difficulty drinking from a cup may require techniques for facilitating jaw stabilization (See Fig. 8, page 12). It should be noted that if the treatment goal is improved intake of liquids in cup drinking, techniques to improve lip closure may be combined with manual techniques to stabilize the jaw.

3) Sucking (a more refined means of liquid intake than suckling) is often seen during the first two weeks of life, chiefly because of the high flexor tone in the neonate. Therefore, the child who has difficulty in sucking may be able to achieve better lip closure if positioned with flexion at the hips and slight flexion at the neck.

4) In normal development the emergence of tongue-tip elevation during swallowing begins with automatic raising of the tongue as the jaw closes. Gradually, as the jaw reopens, the tongue begins to lag behind, and stays momentarily on the alveolar ridge. Later, active tongue-tip elevation, independent of jaw movement, develops. Therefore, in the child with little tongue-tip elevation during swallowing, treatment goals may involve techniques for jaw stabilization.

5) Chewing emerges initially as a combination of two early-developing oral-motor patterns–sucking and the phasic bite reflex. In the child who has difficulty with chewing, emphasis on establishing adequate sucking and/or rhythmical biting may be necessary first.

6) In normal development the tongue lateralization associated with more mature chewing motions appears to occur first in response to placement of food on the side of the mouth. Therefore, in children with chewing problems, at first it is helpful to place food particles between the molars on one side of the mouth and later on the center of the tongue.

It is not within the scope of this book to present specific how-to activities about improving oral-motor function in sucking, swallowing, chewing, etc. However, such information is available in publications about feeding the handicapped child (see References).

Using other professionals is probably the best resource, because specific activities (such as Rood facilitation techniques) (Loiselle, 1979) can actually be demonstrated and explained. Occupational therapists, physical therapists, nurses, nutritionists, and speech pathologists in the area may all have helpful information about oral-motor functioning.

CASE STUDIES

The case studies presented are actual cases taken from records of the University of Tennessee Child Development Center. The inpatient facility referred to is Happy Acres Home Life Center, which was a part of the Child Development Center until June, 1980. An interdisciplinary team from the Center carried out the diagnostic evaluations on these patients, planned their care with the parents, and provided follow-up. However, their primary health care providers were private physicians and/or local health service professionals. During residency, Happy Acres Home Life Center provided the primary care in conjunction with the community health care professionals as well as the interdisciplinary team of the Child Development Center.

As can be seen from these examples, remediation requires repeated assessment, planning, and monitoring. For success, the process must continue until the problem is completely solved. It is a very time-consuming, costly process and requires much coordination.

The individualized service plans for each case deal most specifically with the problems associated with feeding. No attempt was made to provide a plan for total health care.

BEHAVIOR: Vomiting and Refusal of Special Formula in a Toddler with PKU

Ruth is the third child of a college-educated, white middle-class couple. At nine days of age she was found to have phenylketonuria (PKU). Her brother, who is five years older, also has PKU, but their older sister does not. Both PKU children have been treated by diet since their first few days of life. Their diet is the usual one for children with this disorder: Lofenalac*, a special formula low in the amino acid phenylalanine, which is supplemented with protein, calories, vitamins, and minerals from normal food sources. Ruth has no physical problems other than PKU. Psychological evaluation at twelve months of age showed her to have average intelligence.

Although weaned to a cup for all other liquids around seven months of age, she continued to drink the Lofenalac formula from a bottle. Her mother explained that Ruth had been ill around the time she was weaned. Because of the importance of drinking all of the formula every day, her mother allowed the sick, irritable baby to drink it from the bottle. After her illness, Ruth continued to reject the formula when offered in a cup – possibly because of its odor, which is not as noticeable when presented in a bottle.

When she was 16 months old, she had another brief illness during which she vomited several times. She continued to vomit her formula and began to reject it after her illness, even when it was offered in her bottle. The mother called her private pediatrician, who advised her to throw away all the bottles and insist that Ruth drink only from a cup. She then called the pediatrician on the Inborn Errors of Metabolism (IEM) Team, which had provided follow-up care for both her PKU children. The pediatrician presented the problem to the team, which also includes a social worker, a nutritionist, a biochemist, a nurse, and a psychologist.

The psychologist called the mother to learn the details of the problem and work out a solution. The evaluation, treatment, and follow-up were done entirely by telephone. This was possible because the problem was quite circumscribed and the mother and team members had a good working relationship. The problem behaviors were: (1) rejection of Lofenalac presented in a cup (refusing to drink and throwing the cup) and (2) gagging, vomiting, or both. The main result of these behaviors was that Ruth was ingesting little or none of the formula necessary for control of PKU. Her mother had been giving her the other foods, both liquid and solid, permitted on her diet whether she took any formula or not. The goal of treatment was to get Ruth to take all the formula prescribed for her.

Because the main (in most cases the only) motivation for eating is to satisfy hunger, the team decided to try withholding all foods or liquids except water until Ruth took at least a sip of her formula. If her caloric needs were being met through other sources, she would not be hungry and would continue to refuse the formula. There are no ethical problems in doing this, since she would be offered nourishing (indeed, essential) food, even though she might refuse it. When this decision had been made, the mother was given the following instructions:

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*Registered trademark

1) Discard all the baby bottles while Ruth watches. This will demonstrate that they are gone and will make it harder for you to give in to her and resume feeding her by bottle.

2) Offer one-half to one ounce of formula at first. If she throws the cup, take her out of the high chair for ten minutes before trying again. Ignore all protests. Do this no more than three times per session (meal). If she has not taken any formula after three tries, stop the session. Between sessions, give her as much water as she wants, but nothing containing calories, since she has to be hungry at the next meal. This will not hurt her.

3) Use preferred food (solid or liquid such as juice) as well as praise to reward drinking any of the formula. Then offer more formula. If she refuses it, repeat step two.

4) If necessary, use an adaptation of the "Mini-Meal" (Azrin & Armstrong, 1973): six small meals per day instead of three large ones. This will provide more opportunities for practice.

Ruth's mother preferred giving the Lofenalac as a paste mixed with strained peaches rather than in liquid form. After consultation with the nutritionist and pediatrician, the psychologist told her this would be acceptable if she would give Ruth more fluids to make up for the liquid normally in the formula. Otherwise, she was to follow the procedures outlined above.

All this took place on a Friday. The psychologist gave Ruth's mother his home telephone number and told her to call if necessary. She did not call during the weekend or on the following Monday, so the psychologist called her on Tuesday. She said Ruth tried to reject the paste Friday evening, but ate all of it Saturday. She rejected it Sunday morning, but by early that afternoon was willing to eat it again. She ate half of it and gagged (but did not vomit), so her mother gave her half of her usual lunch. She had to take Ruth out of the high chair only twice during the weekend; each time Ruth ate all the paste when put back in the chair. There have been no further problems in feeding Ruth in the 15 months since these procedures were carried out.

In summary, a 16-month-old girl with PKU began refusing or vomiting the special formula she had to drink to prevent mental retardation and promote normal growth. Through consultation with her mother, a behavior modification program was developed, and the child learned to take the formula again. This case shows how some problems with very serious potential consequences can be handled in a relatively simple way and at minimal cost.

SAMPLE INDIVIDUAL SERVICE PLAN

Identifying Information	Diagnosis	Code	Case History
Name: Ruth Case Number: 6321 Date of Birth: 8-6-78 CCS Eligible: no Medicaid Eligible: no	Referral Diagnosis: Phenylketonuria Additional Diagnosis: None		Attached: Located at: University of Tennessee Child Development Center Memphis, TN 38105

Other Service Plans	If Included	Evaluations Completed	Date	Further Evaluations Required
none		Social Work	9-78	Complete reevaluations annually.
		Pediatrics (most recent)	8-79	
		Psychology (most recent)	8-79	IEM Team Conferences every 3 months (more often if necessary).
		Nutrition (most recent)	8-79	
		Inborn Errors of Metabolism Team Conference (most recent)	11-79	

Strengths	Limitations	Needs	Goals & Long-term Objectives
Average intelligence Feeds self with spoon Drinks from cup or glass except Lofenalac formula Parents conscientious and cooperative	Will take Lofenalac only from baby bottle; recently started rejecting or vomiting it, apparently voluntarily. Dietary limitations (PKU diet).	To resume taking Lofenalac as prescribed. To continue follow-up care by IEM Team.	1. Get child to take Lofenalac as prescribed. 2. Maintain normal developmental progress. 3. Educate child about PKU, as she shows ability to understand.

SAMPLE INDIVIDUAL SERVICE PLAN

Number	Objectives (including measurement)	Activities	Provider	Beginning Date	Frequency	Duration	Achievement or Termination Date
1.	Get Ruth to take all prescribed Lofenalac as soon as possible.	See progress notes in chart for 12-7-79	Mother, in consultation with IEM Team at CDC	12-7-79	3 times per day	Until at least age 6 years	To be achieved as soon as possible; if not achieved by 12-11-79 plan to be modified re number of training sessions (meals) per day. Other factors (rewards, etc.) to be revised, if necessary.
2.	Get mother to carry out program at home.						

Additional Information or Comments

Case Manager	Responsible Agency	Estimated Cost	Date Established
Nutritionist/ Psychologist	UTCDC		12-7-79
Developed By	TITLE AND AGENCY	Review Date(s)	Compiled By
Clinical Staff	Child Development Center	12-11-79	Child Development Center Clinical Records Department

HYPERTENSION/OBESITY: Diet and Drug Interaction

Tony, a black male (birthdate 2-26-68) presented for diagnostic evaluation at the Center in 1979, with the problems of obesity, hypertension, suspected mental retardation, limited vision, allergic diathesis, and seizure disorder. The diagnosis of Prader-Willi Syndrome had been ruled out prior to this evaluation. The child was enrolled in a special education class in the city schools. He came from a multi-problem, one-parent family with limited financial resources and complicated medical and social problems. The mother was limited educationally, had difficulty in managing his insatiable appetite, and was unable to handle his behavioral outbursts when he did not get what he wanted. She had a history of emotional problems and was receiving treatment at a local mental health center.

Several medical specialists had been following Tony prior to his coming for evaluation at the Center, and little coordination had been done. As a result when his medications were reviewed, it was quickly recognized that he was taking multiple medications that were interacting to aggravate his hypertension. These are listed below:

1) Carbamazepine (Tegretol) – seizures
2) Methyldopa (Aldomet) – antihypertensive agent
3) Limbitrol (combination of chlordiazepoxide and amitriptyline) – antidepressant
4) Theophylline (Theolair) – spasmolytic agent
5) Metaproterenol (Alupent) – parasympatholytic agent

The child's blood pressure was elevated, being 140/96 in the left arm and 150/90 in the right. (Norms for twelve year olds average 113/59 [Whaley & Wong, 1979]).

Tony was seen for evaluation by representatives of the following disciplines: pediatrics, social work, psychology, biochemistry, dentistry, nursing, education, occupational therapy, recreation therapy, and nutrition. The consensus findings from the evaluation were: hypertension; obesity, 140% overweight for height; mild mental retardation; psychomotor seizures; polypharmacy; congenital glaucoma with secondary cataract, right eye; allergic diathesis, by history; history of overweight in family, mother; single parent family, child living with mother; inconsistent discipline; history of depression, mother; health problems, mother (diabetes and hypertension); and income entirely from governmental assistance, SSI and AFDC.

Since the family had multiple problems, setting priorities was difficult. Coordination of medical follow-up to prevent the polypharmacy was seen as a primary need. Health maintenance on a limited kilocalorie, low sodium diet was a priority, also. Though the resources of this family were limited, the mother was assertive and continued to seek assistance. With the family's dependence on the governmental assistance received for Tony, they were unable to allow residential follow-up for his problems, but chose to work through the problems on an outpatient basis. The mother needed continual supportive counseling in order to cope with the situation.

The goals for remediation included: decrease the child's weight to assist in control of hypertension; prevent polypharmacy; continue supportive counseling for the mother; and continue special education program in the city schools.

The overall plan of care was coordinated and monitored by the social worker. The nutritionist provided monitoring of the therapeutic diet and nutritional status of the child on a routine basis. The weight management program included simple exercises planned by the occupational therapist. The pediatrician communicated with other medical specialists to develop an appropriate medication regime. The city schools continued to provide special education for the child until he could go into a vocational rehabilitation program. Supportive counseling was continued for the mother at a local mental health center.

At the time of this writing the child has been followed for almost three years. The outcome is partly successful, although progress has been slow and much remains to be done. Through modified medications and appropriate dietary treatment, the hypertension is now under control. Some weight loss has occurred – Tony is 103% overweight rather than 140%, as originally reported. He continues on a low sodium reduction diet and is followed on an outpatient basis by the nutritionist. Social work supportive counseling is continuing for the mother at a local mental health center; she has shown some improvement in her management of Tony. Medical monitoring continues. The child is progressing in the special education class, and plans are underway to phase him into a vocational program.

SAMPLE INDIVIDUAL SERVICE PLAN

Identifying Information	Diagnosis	Code	Case History
Name: Tony Case Number: 6102 Date of Birth: 2-26-68 CCS Eligible: yes Medicaid Eligible: yes	Referral Diagnosis: Mild Retardation Additional Diagnosis: Seizure disorder, obesity, arterial hypertension, congenital glaucoma, esotropia, partially blind, poor dental hygiene, excessive intake of food		Attached: Summary Located at: UTCHS-CDC, 711 Jefferson Avenue Memphis, Tennessee 38105

Other Service Plans	If Included	Evaluations Completed	Date	Further Evaluations Required
Memphis City Schools		Pediatrics	3-80	
		Social Work	3-80	none
		Psychology	3-80	
		Nutrition	3-80	
		Dentistry	3-80	
		Nursing	3-80	
		Education	3-80	
		Biochemistry	3-80	
		Occupational Therapy	3-80	
		Recreation	3-80	

Strengths	Limitations	Needs	Goals & Long-term Objectives
Accepting, understanding mother. Mother has fighting spirit to overcome problems.	Multiproblem family with limited social and financial support.	Continuing financial support for family. Supportive counseling for mother. Improved child rearing practices and weight control for child using behavior management training.	1. Reduce weight and hypertension. 2. Coordinate medical follow-up to prevent polypharmacy. 3. Continue special education to help child reach maximal level of development. 4. Continued supportive counseling for mother.

SAMPLE INDIVIDUAL SERVICE PLAN

Number Objectives (including measurement)	Activities	Provider	Beginning Date	Frequency	Duration	Achievement or Termination Date
1. Reduce weight using 1500 calorie diet low in sodium with monitoring to include measures of height, weight, lab data, and food records.	Weight management follow-up on in-patient basis to include nutrition education for mother and child	CDC	3-80	monthly	1 year	3-81
2. Coordinate medical follow-up to prevent polypharmacy.						
3. Continue special education classes until completed.	School program in class for mildly retarded children	Memphis City School	annually	5 days per week	Until program is completed at age 18	1986
4. Continue supportive counseling for mother, as needed.	Counseling sessions, medical follow-up	Local mental health center or CDC, Gailor Clinic	3-80 3-80	monthly or more often, as needed	Until problem is resolved	

Additional Information or Comments

Case Manager	Responsible Agency	Estimated Cost	Date Established
Social Worker	Child Development Center		3-81
Developed By	TITLE AND AGENCY	Review Date(s)	Compiled By
Clinical Staff	Child Development Center	3-81	Child Development Center Clinical Records Department

PHYSICAL: Gastroesophageal Reflux Problem

Melissa was presented for evaluation to the interdisciplinary team through outpatient diagnostic services. The primary reason for referral by her private pediatrician was significant developmental delay with a suspected seizure disorder. Review of the parent/family pre-assessment questionaire and medical records revealed a five year, one month old, black non-ambulatory child, dependent upon the parents for total care. Melissa had no communication skills. She was described as being difficult to feed as an infant and lost the ability to suck at six months of age.

The parents were young at the time of conception (mother age 22, father age 25), with no consanguinity noted in information received prior to evaluation. Melissa was not the first pregnancy. Two years prior to Melissa's birth, a sibling had died at age one year, six months from "cerebral palsy," according to the parent's report.

Both parents were employed in a factory in the rural community where they live. While the parents worked, Melissa stayed with a baby sitter, who kept three other children. The combined family income fell within the $10,000-$15,000 range. Both parents were high school graduates. The mother had completed two years of college. She hoped to complete work toward a degree.

The evaluation team was composed of a social worker, pediatrician, audiologist, nutritionist, physical therapist, pediatric neurologist, psychologist, and dentist. Following the evaluations, the staff members met and developed consensus findings and recommendations. The findings were: profound mental retardation; spastic quadriplegia; microcephaly; kyphosis; scoliosis; suspected dislocation of the left hip; bilateral esotropia; suspected seizure disorder (no medication); short stature; underweight (24% below mean—weight/stature); limited fluid intake; history of early feeding problems; limited fluid intake; limited intake of calories, calcium, iron, vitamin D, thiamin (less than ½ recommendation of NRC-RDA for age); inappropriate feeding position; mechanical feeding problems—chewing and biting; self-injurious behavior (pulls out hair and scratches face); and vomiting following meals.

Based upon these findings and the lack of services in Melissa's home town, the staff referred her to an inpatient facility for rehabilitation and parent training. Goals included follow-up for seizure activity with referral to the private pediatrician for treatment; physical therapy with appropriate seating and positioning; occupational therapy evaluation of oral function with recommendation to improve chewing; continuous review of nutritional status with a nutritionally balanced diet high in calories; sensory stimulation; and behavior modification to decrease self-injurious behavior.

When Melissa was admitted to the inpatient facility, routine laboratory work revealed hematocrit – 40%, hemoglobin – 14.0 g/dl and MCHC – 31.1 g/dl RBC's. Urine screen was within normal limits except for a slightly elevated ketone level, a trace of keto acids, and a heavy-normal pattern of amino acids by high voltage paper electrophoresis. A height of 92.7 cm and weight of 10.9 kg was recorded. A diet to foster weight gain was recommended (kilocalorie level per kg of body weight was based on Beal's data using the 90th percentile for age [Beal, 1970]).

The vomiting after meals was a serious problem. The staff initially thought it was due to improper feeding position. The physical therapist recommended appropriate seating to optimize Melissa's voluntary head control. Special positioning with Melissa propped at a 60-65 degree angle for 20 minutes following meals was recommended, also.

In addition to an increased calorie diet, other diet modifications included offering six feedings a day. Portion sizes were half the amount recommended for age, and foods of high nutrient density were chosen. The food offered was chopped coarsely to provide Melissa an opportunity to chew.

These measures decreased the vomiting, and a very slow weight gain occurred. However, within a few weeks the frequency of post-prandial vomiting increased. Following a meeting of the interdisciplinary feeding team, a gastroenterology consultation was sought to rule out the possibility of a gastroesophageal reflux. At this time Melissa was anorexic, still underweight, and appeared malnourished.

A barium swallow and upper gastrointestinal series revealed some aspiration during swallowing with gastroesophageal reflux. Because of Melissa's mechanical feeding problems and poor head control, feeding by naso-gastric tube was inappropriate. Oral feeding had been frustrating and little progress had been made due to post-prandial vomiting. To reduce vomiting and feeding problems and to improve nutritional status, a gastrostomy tube was recommended.

The parents were informed of the risks and benefits of this procedure and agreed that it must be done. Total parenteral nutrition was used to improve Melissa's health prior to surgery.

After insertion of the gastrostomy tube, the hospital dietitian instructed the mother about the tube feeding to be used. The child was discharged from the hospital and returned to the short-term residential facility. Two months post-surgery, she had shown a steady weight gain, appeared more alert, and had more stamina. She continued to received oral stimulation so that the minimal oral function present would not be lost. Although her prognosis is guarded, the goal remained for Melissa to eventually be able to accept all food orally and no longer require the feeding tube.

SAMPLE INDIVIDUAL SERVICE PLAN

Identifying Information	Diagnosis	Code	Case History
Name: Melissa Case Number: 5619 Date of Birth: 5-21-75 CCS Eligible: yes Medicaid Eligible: yes	Referral Diagnosis: Profound mental retardation Additional Diagnosis: Spastic quadriplegia, mixed hyper-hypotonia, microcephaly, suspected seizure disorder, underweight, short stature, history of early feeding problems, post-prandial vomiting		Located at: UTCHS Child Development Center 711 Jefferson Avenue Memphis, TN 38105

Other Service Plans	If Included	Evaluations Completed	Date	Further Evaluations Required
Child Development Center		Pediatrics	12-80	Pediatric Neurology
		Social Work	12-80	
Crippled Childrens Service		Physical Therapy	12-80	Occupational Therapy
		Psychology	12-80	
Flower School		Nutrition	12-80	
		Nursing	12-80	
		Dentistry	12-80	
		Biochemistry	12-80	

Strengths	Limitations	Needs	Goals & Long-term Objectives
Parents are motivated to seek the best means for helping Melissa. Parents are loving and caring. Melissa is pleasant and sociable. Melissa responds to therapy and is not resistive to new situations.	Melissa is difficult to feed. Medical problem (gastro-esophageal reflux) makes provision of balanced diet to produce weight gain impossible. Melissa is emaciated. Melissa is quite impaired physically. Local resources for help are limited.	Evaluation of gastroesophageal reflux. Adaptive chair. Appropriate follow-up medical care. Parent counseling regarding diet, weight gain, positioning for meals, food preparation. Referral to appropriate school program in the community.	1. Medical evaluation, setting priorities for care. 2. Gastrostomy tube feeding. 3. Commercial Tube Feeding - 1800-2000 cc/day evenly divided into four feedings, 1800 kcal. with 20% protein, 30-35% fat and 50-55% carbohydrate, plus extra water to meet fluid needs. 4. Appropriate seating for feedings. 5. Supportive counseling for parents. 6. Re-evaluation in one month.

SAMPLE INDIVIDUAL SERVICE PLAN

Number	Objectives (including measurement)	Activities	Provider	Beginning Date	Frequency	Duration	Achievement or Termination Date
1.	Melissa will be referred for an appropriate medical evaluation to determine cause of vomiting following feedings.	Referral to pediatric gastroenterologist.	HAHLC and LeBonheur Childrens Hospital	3-10-81	three times	two weeks	3-21-81
2.	A seat will be designed for Melissa to help her achieve a satisfactory position for eating.	Evaluation by occupational and physical therapists, with referral to rehabilitative services for chair.	CDC Rehabilitative Services	1-2-81	two times	one month	2-1-81
3.	Parents will receive counseling in how to care for Melissa, including nutrition, physical therapy, and nursing.	Parent counseling by each discipline, completing goals as determined by each discipline.	HAHLC	4-10-81	six sessions	one hour per session	4-30-81

Additional Information or Comments

Case Manager	Responsible Agency	Estimated Cost	Date Established
Pediatrician	CDC-HAHLC		12-80
Developed By	TITLE AND AGENCY	Review Date(s)	Compiled By
Interdisciplinary Team Happy Acres Home Life Center	HAHLC University of Tennessee CDC	12-80	Clinical Records Department Child Development Center

GROSS MOTOR: Inability to Maintain Proper Position for Eating

Butch, is an eight-year-old black child who is unable to sit or walk independently. The parents were divorced when he was three years old; his father visits the family once a year and is reported to pay child support only under court order.

Butch and his loving mother live in a home of their own near the maternal grandparents. His mother works during the day at a low-income job, and Butch attends a public school program or stays with a babysitter. The mother has sought appropriate programs for him and has been persistent with the school board, urging them to find a class suitable for him.

Problems have been noted with Butch since birth. His mother received prenatal care and knows of no complicating factors during her pregnancy. At the time of delivery by Cesarean section, Butch was not breathing on his own, and he was placed on a respirator. He had multiple seizures until two years of age and has continued to be under the care of a pediatric neurologist who has prescribed medications for seizure control since birth.

Butch was first evaluated in a primary care center for routine health care when he was three years old. The problems noted by the primary care team at that time consisted of microcephaly; suspected mental retardation; spasticity in all four extremities without contractures; right inguinal hernia; recurrent ear infections; ringworm of the scalp; and drooling. The mother reported some difficulty in feeding Butch. At her request, the nurse practitioner demonstrated a way to properly position Butch at mealtime, using pillows for lateral support, a cardboard box to provide firm seat and back support, and a wooden block for foot support. The nurse practitioner also made a home visit to observe home care and mealtime problems. Butch was referred to Crippled Children's Services for further evaluation because of his orthopedic problems. Continued follow-up in the primary care clinic with a return every six months was recommended. An additional referral to the dentist was suggested for routine dental care.

Butch presented multiple problems during repeated visits to the primary care clinic. At age eight his mother expressed her concern that Butch was unable to sit independently and asked for special seating equipment to use during feeding. At this visit the health care team noted that the scoliosis (which had been observed two years previously) had worsened and that Butch had a leg length discrepancy. The primary care clinic recommended that the public health department be asked for physical therapy services and a combined occupational therapy and nutrition consultation because of the continued difficulties in eating. Other recommendations of the clinic included ongoing physical, occupational, and speech therapy services from the public school and a referral to a Rehabilitation Engineering Center for the development of a specially adapted chair.

The case of Butch demonstrates the complexities of a multiply-handicapped child, the need for ongoing interdisciplinary care, and the importance of cooperation between several agencies to meet the varied needs of such a child.

SAMPLE INDIVIDUAL SERVICE PLAN

Identifying Information	Diagnosis	Code	Case History
Name: Butch Case Number: 5056 Date of Birth: 3-30-73 CCS Eligible: yes Medicaid Eligible:	Microcephalic Spastic Quadriparesis Partial Seizure Disorder, Complex Profound Mental Retardation, Suspected		Located at: Crippled Children's Services

Other Service Plans	If Included	Evaluations Completed	Date	Further Evaluations Required
Crippled Children's Services		Orthopedics	12-79	Dentistry
		Pediatrics	12-79	Orthopedics
		Nursing (or Nurse Practitioner)	12-79	Speech Pathology and Audiology
				Pediatric Neurology
				Nutrition
				Psychology
				Social Work
				Occupational Therapy
				Physical Therapy

Strengths	Limitations	Needs	Goals & Long-term Objectives
Mother is well educated and utilizes resources appropriately. Maternal grandparents live nearby; extended family is supportive. Mother has positive, loving relationship with child. Child is pleasant and easily worked with during activities. Child is able to tolerate a diet with chopped meat.	Child has spasticity which interferes with movement, is unable to sit, and has orthopedic problems. Child drools profusely. Child has seizures which are only partially controlled by medication.	Evaluation by Crippled Children's Services orthopedist re: leg length discrepancy and scoliosis. Obtain appropriate adaptive chair. Follow-up medical care for seizure disorder. Physical, occupational, and speech therapy in the public schools. Nutrition and occupational therapy counseling.	To attain proper seating during mealtime. To receive a nutritionally balanced diet of regular consistency for all food except coarsely chopped meat. To continue anticonvulsant medication.

SAMPLE INDIVIDUAL SERVICE PLAN

Number	Objectives (including measurement)	Activities	Provider	Beginning Date	Frequency	Duration	Achievement or Termination Date
1.	Butch will obtain a special chair for feeding.	Refer to Rehabilitation Engineering	Rehabilitation Engineering	1-80	six trips	2 months	3-80
2.	Butch will eat a nutritionally balanced diet of regular consistency except for chopped meats (nutritional status will be monitored via 3-day food records).	Nutrition and Occupational Therapy counseling with mother; observation; 3-day food records	Public Health Department	1-80	monthly	6 months	6-80
3.	Butch's seizures will be recorded for frequency and duration and side effects of medication monitored.	Observation	Primary Care Center	1-80	daily	ongoing	--

Additional Information or Comments

Parents are divorced; mother travels with her work.

Case Manager	Responsible Agency	Estimated Cost	Date Established
Nurse	Primary Care Clinic		12-79
Developed By	**TITLE AND AGENCY**	**Review Date(s)**	**Compiled By**
Clinical Staff	Primary Care Clinic	3-80 and 6-80	Records, Primary Care Clinic

ORAL-MOTOR: Mechanical Feeding Difficulty

Stephanie was a blond, blue-eyed 16 month old when first evaluated at the Child Development Center. Shortly after birth she suffered cerebral hemorrhaging and breathing difficulty and began having seizures. An EEG later revealed hypsarrhythmia, a type of seizure disorder usually characterized by spasms and associated with mental retardation. Stephanie was tube-fed in the newborn nursery during the first three weeks of life. When she went home at three and one half weeks, she was able to take a bottle but exhibited difficulty with sucking and swallowing.

According to her parents, at sixteen months of age Stephanie's care did not interfere with normal family activity. She was still regarded by her parents and three older sisters as the baby. However, the parents were haunted by why this happened and what to expect in the future. At the time of the evaluation Stephanie had just completed a six month trial of physical therapy in which she made little progress. Stephanie had developed neither head control nor sitting balance. Her parents acknowledged that they knew Stephanie's future development might be slow and limited, but they were not considering permanent residential care. Their major goal was to learn how to work with and care for Stephanie at home. The most immediate need involved feeding; Stephanie continued to have difficulty with sucking and swallowing. She frequently choked and spit up her food. Moreover, her diet was limited to strained foods.

Stephanie was evaluated by the following disciplines during her initial assessment: social work, psychology, pediatrics, nutrition, nursing, physical therapy, audiology, otolaryngology, and pediatric neurology. Stephanie appeared to be a passive child, content to lie on her back with her legs in a "frog leg" posture. She smiled in response to speech, babbled frequently, and kept her fingers constantly in her mouth. This child did not consistently follow objects visually or handle them purposefully. During the physical therapy evaluation severe hypotonia with hyperflexibility was noted. Stephanie exhibited no labyrinthine righting, equilibrium, or supporting responses. Gross motor skills were at approximately the four month level. Psychological assessment revealed intellectual functioning within the profound range of mental retardation with a mental age of almost two months.

A summary of formal findings during the evaluation included: hypotonic quadriparesis; infantile massive spasms by history; hypsarrhythmia; microcephaly; suspected blindness; serous otitis media, bilateral; short stature; emaciated condition (28% underweight); deficient intake of calories for age; and mechanical feeding difficulty (swallowing). The interdisciplinary team recommended that Stephanie be admitted to a residential program for short term training. Follow-up evaluations by occupational therapy, otolaryngology, and ophthalmology were also suggested.

During the two month training period, major goals included: 1) improving gross motor skills; 2) improving sucking and swallowing; and 3) increasing calories in Stephanie's diet with nutrition counseling for her mother.

The objective of improving gross motor skills was broken down into the following specific goals: improving muscle tone; improving head control in prone, supine, and sitting; and facilitating labyrinthine righting responses and equilibrium responses in prone and supine (in conjunction with stimulating better head control). Sensorimotor activities such as spinning, fast rolling, and swinging were used for vestibular stimulation to improve muscle tone. Approximation and traction were used to improve extension and flexion in both the neck and trunk musculature. Rotational activities in rolling and sitting were stressed.

The major objectives of occupational therapy involved improving lip closure, sucking, and swallowing. Stephanie continued to drink liquids from a bottle with a regular-sized hole until sucking improved. A Nuk-Sauger* pacifier was provided for her while she was sitting in a chair in the play area or while an adult was vibrating around her mouth. Vibrating and icing techniques, along with manual techniques, were prescribed by the occupational therapist to facilitate lip closure and sucking.

Stephanie'e caloric intake was increased with a diet of appropriate caloric level and consistency to promote weight gain. Through parent counseling the dietary intake at home was improved. Dietary supplements such as

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* Registered trademark

Ensure* and Instant Breakfast* were recommended to provide additional calories until oral abilities improved and more food was retained.

When discharged after two months, Stephanie was described as more alert; and although a significant weight gain was not noted, her appearance had improved greatly. The following behaviors involving gross motor skills were demonstrated: good labyrinthine righting responses; anterior propping in sitting (beginning); good head control in sitting; holding extended arm position in prone; assisting in pulling to sitting; lifting head in supine; sitting for one minute while propping forward on arms; pivoting in prone; and getting on her hands and knees (beginning to crawl). Feeding skills had also improved. She was able to achieve better sucking and swallowing, and had begun to accept some finger foods. Appetite had improved with the addition of new foods.

Stephanie was admitted for a second two month training period about eight months later. Goals emphasized continued improvement in gross motor and feeding skills. At the end of her stay, Stephanie demonstrated good head control. She was able to sit unsupported for 30 minutes and crawl on all fours. She began to make some chewing motions, and her diet was modified to include chopped vegetables and pureed meats.

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*Registered trademarks

SAMPLE INDIVIDUAL SERVICE PLAN

Identifying Information	Diagnosis	Code	Case History
Name: Stephanie Case Number: 4512 Date of Birth: 5-2-78 CCS Eligible: yes Medicaid Eligible: yes	Referral Diagnosis: Profound mental retardation Additional Diagnosis: Hypotonic quadriplegia, microcephaly, hypsarrhythmia, infantile massive spasms, short stature, deficient intake of calories, mechanical feeding difficulty.		Attached: Summary Located at: UTCHS-CDC, 711 Jefferson Avenue, Memphis, TN 38105

Other Service Plans	If Included	Evaluations Completed	Date	Further Evaluations Required
		Pediatrics	6-80	
		Psychology	6-80	None
		Social Work	6-80	
		Occupational Therapy	6-80	
		Physical Therapy	6-80	
		Nutrition	6-80	

Strengths	Limitations	Needs	Goals & Long-term Objectives
Easily worked with in therapy. Responds well to sensory stimulation. Socially responsive. Not dominated by primitive reflexes.	Needs much motivation to move. Poor muscle strength in addition to poor muscle tone. Poor sucking and swallowing. Emaciated - deficient intake of calories.	Physical therapy to improve gross motor skills (especially head control and sitting). Occupational therapy to improve feeding skills (sucking and swallowing). Nutrition counseling for parent to increase calories in diet.	1. To improve gross motor activity. 2. To improve feeding skills. 3. To improve caloric intake at home.

SAMPLE INDIVIDUAL SERVICE PLAN

Number	Objectives (including measurement)	Activities	Provider	Beginning Date	Frequency	Duration	Achievement or Termination Date
1.	Stephanie will show improved head control in prone, supine, and sitting in two months.	Physical therapy to include sensorimotor activities (spinning, fast rolling, swinging, approximation, traction, and rotational activities)	CDC - Physical Therapy	10-80	daily	2 months	12-80
2.	Stephanie will show improved sucking and swallowing in bottle-drinking in two months.	Occupational therapy to include vibrating, icing, and other facilitation techniques	CDC - Occupational Therapy	10-80	daily	2 months	12-80
3.	Mother will provide more calories in diet.	Parent counseling re: use of supplement and general nutrition	CDC - Nutrition	12-80	one time	1 session	12-80

Additional Information or Comments

Case Manager	Responsible Agency	Estimated Cost	Date Established
Physical Therapist	CDC		12-80

Developed By	TITLE AND AGENCY	Review Date(s)	Compiled By
Clinical Staff of Child Development Center *Have reference to SSI.		12-80	Clinical Records Department Child Development Center

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GLOSSARY

1. Abduction – Movement away from midline of the body.

2. Adaptive Equipment – Any device or piece of equipment used by the handicapped, usually in the areas of self-help skills, ambulation, and transportation.

3. Adduction – Movement towards the midline of the body.

4. Aggression – An unprovoked attack or encroachment on others.

5. Anabolism – The building of materials and tissues in the body, sometimes called constructive metabolism.

6. Asymmetrical Tonic Neck Reflex – Reflex which is present between birth and four-six months of age, elicited by rotation of the head with increased extensor tone in the chin arm and increased flexor tone in the skull arm.

7. Athetosis – Rapid fluctations in body tone resulting in writhing movements of body parts (head, shoulder, wrists, fingers, hips, ankles, feet).

8. Attachment – A unique relationship of affection between two persons that is specific and endures over time.

9. Behavior – Anything that a person does. Behavior may be simple (such as grasping a spoon) or complex (feeding oneself a meal).

10. Behavior Modification – A set of techniques designed to change behaviors in a systematic way.

11. Birdfeeding – Feeding position in which the child's head is allowed to drop backwards and the food literally slides down the child's throat.

12. Bonding – A very special attachment between a mother or father and his/her newborn infant.

13. Calorie – As used in the nutrition, the correct term is actually kilocalorie, which is a unit of heat; specially the amount of heat required to raise one kg of water one degree Celsius. Kilocalories in food designate energy value.

14. Carbohydrate – Any of certain organic compounds composed of carbon, hydrogen, and oxygen, including sugars, starches, and celluloses. Vegetables, fruits, grains, and dairy products contain carbohydrate. One gram of carbohydrate yields four kilocalories.

15. Caregiver – One who provides the major care for the infant or child, usually a parent.

16. Catabolism – The breaking down of materials and tissues in the body, sometimes called destructive metabolism.

17. Cerebral Hemorrhage – Bleeding into the cerebrum or main portion of the brain.

18. Consanguinity – Kinship: relationship by blood.

19. Cooperative Play – Two or more children playing with toys or each other to achieve a common goal.

20. Crawling – Forward movement of the child while on his stomach.

21. Creeping – Forward movement of the child while on his hands and knees.

22. Dislocation – Complete disruption of contact between the bones constituting a joint.

23. Distal – Parts of the body that are away from midline.

24. Extension – Straightening of the joints of the body or of the body itself.

25. Fat – A mixture of glyceryl esters of fatty acids. Lipids are examples of dietary fats. Dietary fats are found in animal products (meats, milk) and vegetables (avocado, coconut, soy beans, peanuts). One gram of fat yields nine kilocalories.

26. Fine Motor Skills – Use of arms, hands and fingers in such activities as reaching, grasping, releasing, and pincer grasping.

27. Flexion – Bending of the joints of the body or of the trunk itself.

28. Gag Reflex – Reflex which is present throughout life although it begins to fade at approximately seven months. Elicited by stimuli to the back of the tongue producing a gag.

    hyperactive gag reflex – abnormal response to stimulation of the lips or front of the tongue.

    hypoactive gag reflex – lack of normal response to stimulation of the posterior part of the tongue or pharyngeal area.

29. Gastroesophageal Reflux – A backward or return flow of the food or liquid from the esophagus.

30. Grasp – The closure of the hand on an object.

31. Grasp Reflex – Reflex which is present from birth and integrated from four to six months. Elicited when the child is on his back and pressure is applied to the palm of the hand. Response is quick flexion and adduction of the fingers.

32. Hyperactive Behavior – Excessively active for age and social group. Synonyms include overactive and hyperkinetic.

33. Hypersensitivity – Abnormally increased response to stimulation (regarding oral-motor function, refers to response to touch).

34. Hypertonia – Increased muscle tone.

35. Hyposensitivity – Abnormally increased response to stimulation (regarding oral-motor function, refers to response to touch).

36. Hypotonia – Decreased muscle tone.

37. Hypotonic Quadriparesis – Flaccid or "floppy" muscle tone involving weakness in all four extremities.

38. Hypsarrhythmia – A type of seizure disorder usually characterized by spasms and associated with mental retardation.

39. Icing – Used here, an oral facilitation technique which involves moving an ice stick or ice cube around the outside of the lips to stimulate lip closure; initially described by Margaret Rood. This technique should be used only by trained individuals and is currently a controversial subject among experienced therapists.

40. Infantile Massive Spasms – Severe flexion spasms of head, neck, and trunk, with extension of arms and legs (also called jackknife seizures).

41. Jaw Thrusting (Abnormal) – Strong downward extension of the lower jaw, so that the child has difficulty closing his mouth (differentiated from normal lack of fine jaw grading seen in infants when food is presented).

42. Kyphosis – Posterior curvature of the spine, normal in the cervical and lumbar area to a small degree.

43. Lordosis – Anterior curvature of the spine, normal in the cervical and lumbar area to a small degree.

44. Lip Retraction (Abnormal) – The drawing back of the lips so that they form a tight horizontal line over the mouth.

45. Manipulative Skill – Moving an object purposefully while it is held in the hand.

46. Mechanical Feeding Difficulties – Any problems which interfere with sucking, swallowing, biting, or chewing.

47. Mental Retardation – Significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior and manifested during the developmental period.

48. Metabolism – The sum of all chemical changes in the body.

49. Microcephaly – Abnormal smallness of the head, usually associated with mental retardation.

50. Mineral – An inorganic substance in food that functions in metabolic process and as a constituent of tissue (bone, blood).

51. Moro Reflex – Reflex which is present from birth to five or six months of age. Elicited by sudden extension of the neck which results in abduction and extension of the arms and opening of the hands followed by adduction and flexion of the arms and closing of hands.

52. Munching – Earliest stage of chewing; flattening – spreading movements of the tongue, with up-down jaw movements (combination of phasic bite reflex and sucking).

53. Nasal Regurgitation – The loss of liquid or food through the nose during swallowing or sucking.

54. Nuk-Sauger Pacifier* – Specially shaped nipple designed to help infants with poor lip closure achieve a more effective suck.

55. Obligatory – Being unable to break out of the reflexive pattern.

56. Palmomental Reflex – Normally present during the first three months; initiation of sucking in response to touch on the palm of the hand.

57. Parallel Play – Two or more children using similar toys next to one another with no common goal to their activity.

58. Phasic Bite Reflex – Normally present during the first three to five months; a series of opening and closing jaw movements with a rhythmical bite-release pattern, in response to stimulation of the gums.

59. Phenylketonuria – An inborn error of metabolism, transmitted genetically, which results in an inability to convert the essential amino acid phenylalanine into tyrosine due to an absence of an enzyme. If untreated, mental retardation, poor growth, and physical manifestations (e.g. eczema) result. Treatment involves dietary restriction of phenylalanine.

60. Pica – The eating of non-food substances, such as wood, paper, earth, etc.

61. Play – The spontaneous activity of children.

62. Predominant – Being unable to break out of the reflexive pattern for longer than 30 seconds.

63. Pronation – Having the palm of the hand facing downward.

64. Prone – Lying on the stomach with the face down.

65. Protective Extension Backward – Reaction which develops at nine to ten months of age and continues throughout life. Elicited by pushing a sitting child backward. Response is slight rotation of the trunk and placement of the hand backward.

66. Protective Extension Forward – Reaction which develops between six and nine months of age and continues throughout life. Elicited by pushing a sitting child forward or suspending him in prone and moving him forwards. Response is forward placement of hands.

67. Protective Extension Sideward – Reaction which develops at seven months of age and continues throughout life. Elicited by pushing a sitting child sideways. Response is placement of the hand to the side.

*Registered trademark

68. Protein – Any of a class of nitrogenous substances consisting of a complex union of amino acids and containing carbon, hydrogen, nitrogen, oxygen, and frequently sugar. Occurs in meat and meat products, dairy products, some vegetables, and grains. One gram of protein yields four kilocalories.

69. Proximal – Parts of the body that are toward midline.

70. Range of Motion – The angle through which a joint of the body can be moved.

71. Reach – The movement of the hands toward an object.

72. Regression – Reverting to an earlier mental or behavioral level.

73. Release – The placement of an object on a surface by opening the hand.

74. Rooting Reflex – Normally present during the first three months; turning of the head and extension of the tongue in the direction of light touch to the upper or lower lip, or corner of the mouth.

75. Scoliosis – Lateral curvature of the spine.

76. Self-Abusive Behavior – Behavior which leads or may lead to physical injury to oneself.

77. Serous Otitis Media – Inflammation of the middle ear accompanied by an exudate of serum or serum-like fluid.

78. Social – The interaction of the individual with others as a member of society.

79. Solitary Play – An infant or child playing actively with toy(s) away from others.

80. Sterotypic Behavior -- Repetitive, often rhythmic behavior which has no obvious goal except self-stimulation. Examples often seen in retarded children include body-rocking, hand-waving, and head-banging.

81. Subluxation – Partial disruption of the contact between bones that form a joint.

82. Sucking – Up-down movements of the tongue, with a firmer lip seal and less prominent jaw movements, compared to suckling.

83. Suck/Swallow Reflex – A primitive reflex which is usually present during the first three to five months of life. Rhythmical, pumplike sucking-swallowing-breathing pattern in response to stimulation to the middle of the lower lip or tongue.

84. Suckling – Rhythmical protrusion-retraction of the tongue as it presses against the nipple, with wide opening-closing movements of the jaw and without firm lip closure.

85. Supination – Having the palm of the hand facing upward.

86. Supine – Lying on the back with face up.

87. Symmetrical Tonic Neck Reflex – Reflex which develops at approximately six months of age and begins to disappear between eight and twelve months of age. Elicited by flexion or extension of the child's head. Response is flexion of the arms and extension of the legs when the head is flexed and extension of the arms and flexion of the legs when the head is extended.

88. Temporomandibular Joint – The joint at which the temporal bone and the mandible meet.

89. Tilting Response – Response which develops in sitting at seven to eight months of age and continues throughout life. Elicited by tilting of the surface on which the child is sitting. Response is lateral bending of the child's trunk away from the tilt and abduction and extension of the arm and leg on the side away from the tilt.

90. Tongue Retraction (Abnormal) – The strong pulling back of the tongue into the pharyngeal space.

91. Tongue Thrusting (Abnormal) – Forceful protrusion of the tongue from the mouth (stronger than the tongue movements of suckling).

92. Tonic Bite Reflex (Abnormal) – Strong closure of the jaw when teeth or gums are stimulated, often accompanied by difficulty in releasing the bite (differentiated from normal phasic bite reflex).

93. Tonic Labyrinthine Reflex – Reflex which is present from birth until four to six months of age. Elicited by placing the child in prone or supine. Response is increased flexor tone when the child is in prone and increased extensor tone when the child is in supine.

94. Transient – Being affected by a reflex but the reflex may only be noted as a change in muscle tone.

95. Urea – The major end product of human nitrogen (protein) metabolism. It is the chief nitrogenous constituent of urine.

96. Vibrating – Used here, an oral facilitation technique which involves moving a vibrator around the lips to stimulate lip closure; initially described by Margaret Rood. This technique should be used only by trained individuals and is currently a controversial subject among experienced therapists.

97. Vitamin – An organic substance present in minute quantities in food which performs specific functions in the body such as acting as a catalyst. Vitamins are not manufactured by the body and must be provided.

98. Withdrawal – A state of social and emotional detachment.

APPENDIXES

Appendix I. Normal Feeding Development Chart

Appendix II. Developmental Feeding Tool

Appendix III. Foods for Everyday - Types and Amounts

Appendix IV. Commercial Dietary Supplements

Appendix V. Effects of Drugs on Nutrition Status

Appendix VI. Resources for Information or Referral Regarding Feeding and Other Problems of the Handicapped

Appendix VII. Resource Lists

Normal Feeding Development Chart

This chart (pp. 74) conceptualizes the areas and stages of development for infants and children that affect the process of feeding and eating. The areas considered are physical, nutrition, intellectual, gross motor, fine motor, reflex, oral motor, speech and language, and social/behavioral development. The chronological stages include fetal, newborn, infancy I, infancy II, infancy III, infancy IV, toddler I, toddler II, preschool, elementary I, elementary II, preadolescence, adolescence I, adolescence II, adolescence III. The ages for each category are specified on the chart.

The chart provides health professionals with a standard tool for assessing feeding levels. It can be used with the Developmental Feeding Tool (pp. 78) in the assessment of children with feeding problems.

STAGES OF DEVELOPMENT	PHYSICAL	NUTRITION	INTELLECTUAL	GROSS MOTOR
FETAL **Conception - Birth**	Development of anatomic characteristics followed by growth and elaboration of all systems.	Receives nourishment via placenta. Maternal weight gain first trimester 1-2 kg with 0.4 kg per week gain for remainder of pregnancy	Brain grows to about 25% of adult size.	
NEWBORN **Birth - 10 Days**	Average weight - 3.4 kg; average height - 50 cm; average H.C.* - 35 cm. Has large head, round face and chest, prominent abdomen, and short extremities. Loses weight.	Seeks source of nourishment by rooting reflex from bottle or breast, consuming colostrum or prepared formula.	Brain growth continues. Coordination of senses and motor functions begins.	Flexed adducted posture.
INFANCY I **10 Days - 2 Months**	Regains birthweight. Sitting height equal to 57% of body length. Rapid growth of head and body.	Continues to nurse mature breast milk or formula. Not developmentally ready for solid food (orally or physiologically - e.g. renal solute load).	Inspection of surroundings begins. Differentiation of self from others.	Flexed - abducted posture emerges. Head extension in prone (60° at 3 months). Head lag when pulled to sitting. Midline positioning of head begins in supine. Forearm propping.
INFANCY II **3 - 5 Months**	Doubles birthweight. Increases length Posterior fontanel closes. Deciduous teeth begin erupting.	Continues to be nourished by breast milk or formula. Iron stores begin to be depleted	Attention span increases. Hand-eye coordination begins.	Extended-abducted posture emerges. Extended arm position in prone. Rolls prone to supine and back. Head erect in supported sitting (6 months). Sits propping on arms.
INFANCY III **6 - 9 Months**	Subcutaneous fat reaches peak by 9 months. Closure of anterior fontanel by 9 months.	Oral mechanism ready to accept solid food. Cereal introduced first in a very thin consistency. Consistency thickened, as tolerated. New foods introduced, as tolerated.	Imitation of others begins. Understands a few words.	Rotational patterns emerge. Sits erect with hands free. Re-erects self in sitting and comes to sitting independently. Pivots on stomach. Pulls to standing. Crawls on stomach.
INFANCY IV **10 - 12 Months**	Triples birthweight. Average H.C.* - 47 cm. equals chest circumference. Six to 3 teeth present.	Tooth eruption progresses to tolerate transition from pureed to chopped foods. Formula or breast milk recommended until end of the first year.	First words. Concept of object permanence develops. Brain weight now about 75% of adult's.	Independent mobility by crawling (9 months), creeping (12 months), or walking (12-15 months). Pivots on hips in sitting. Walks holding onto furniture.
TODDLER I **1 Year**	Loses subcutaneous fat. Mild lordosis and protuberant abdomen appear. Eight more teeth erupt.	Growth continues at a rapid pace (physical and brain). Appetite good with bite size foods tolerated.	More words appear; words combined into phrases and short sentences. Thought can sometimes be substituted for action.	Climbs on and off furniture. Sits in a small chair with no lateral support. Walks well and rises to standing without assistance.
TODDLER II **2 Years**	Slow but steady gain in height and weight.	Tolerates regular foods well. Growth begins to slow with some decrease in appetite.	Perception of self as distinct from others very prominent; child very assertive.	Runs. Ascends and descends stairs independently. Backs self into a small chair for sitting. Squats in play. Rides and steers a tricycle well.
PRESCHOOL **3 - 4 Years**	Slowed steady height-weight gain. Lordosis and prominent abdomen disappear. Face grows faster than cranial cavity. Jaw widens.	Assertion of independence increases. Appetite declines with picky food habits.	Concept of "conservation" begins (i.e., some features of objects remain the same despite changes in other features)	Stands and hops on one foot. Jumps heights and distances.
ELEMENTARY I **5 - 6 Years**	Steady average weight gain 3-3.5 kg/yr and height gain of 6 cm/yr. Growth of head slows.	Rate of growth stabilizes, accompanied by more regular appetite. Likes to be included in food related activities.	Child can begin to take others' viewpoints. School begins.	Rides a bicycle. Begins organized play activities and perfects game skills.
ELEMENTARY II **7 - 9 Years**	Steady growth. Spine straightens. Deciduous teeth shed. Respiratory infections are common.	Appetite good with acceptance of a variety of foods. Optimal time to provide nutrition education.	Basic academic skills applied to everyday situations.	
PREADOLESCENCE **10 - 11 Years**	Fat begins to accumulate. Rapid growth spurt parallels onset of puberty. Onset varies with individual.	Begins to experience body changes with increased energy needs. Girls at peak of caloric needs with increased iron requirements.	Concrete reasoning improves.	
ADOLESCENCE I **12 - 13 Years**	Voice changes in boys and muscle mass increases in boys.	Accelerated growth with cognitive and emotional changes. Balanced diet important, but harder to supply due to peer pressure.	Abstract reasoning begins. Hypotheses formed and tested, increasingly by "thought experiments." Judgment often immature because of lack of experience rather than inability to reason in adult manner.	
ADOLESCENCE II **14 - 15 Years**	Sitting height equals 52% of length. Lower red blood cell count and hemoglobin in girls.	Asserts more choice of foods. Boys are at peak caloric requirement. Food selection continues to be influenced by peer pressure.		
ADOLESCENCE III **16 - 18 Years**	Increased creatinine output in boys. Ossification completed.			

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*Head circumference

FINE MOTOR	REFLEX	ORAL/MOTOR	SPEECH AND LANGUAGE	SOCIAL/BEHAVIORAL
Sucks thumb in utero.		Embryological development of oral structures: lips, tongue, hard palate, soft palate, peripheral muscles.		
Grasp reflex. Palmomental reflex. Inserts thumb when hand is brought to mouth.	Sucking, rooting, gag, asymmetrical tonic neck reflex (ATNR) present. Moro and tonic labyrinthine reflexes emerge.	Rooting reflex. Gag reflex. Sucking (flexor tone in neonate). Suckling. Phasic bite reflex. Palmomental reflex. Smooth coordination of suck, swallow, breathing.	Birth cry. Cry becomes longer. Strong, rhythmical breathing.	
Grasp reflex continues. Hands often open. Ulnar side of hand strongest. Mouthing of fingers and mutual fingering.	Rooting (3 months) and sucking (2-5 months) disappear. Phasic bite reflex present.	Suckling, phasic bite reflex, palmomental reflex continue.	Smiles. Visually localizes speaker. Breath stream lengthens. Coos (vowel sounds). Uses special cry for hunger.	Regards face. Eye contact. Smiles.
Raking fingers. Immediate approach and grasp on sight, then eyes and hands combine in joint action. Radial fingers begin to dominate.	Grasp reflex disappears (4-6 months) and moro disappears (5-6 months). Tonic labyrinthine disappears (6 months). Symmetrical tonic neck reflex (STNR) emerges at 6 months.	Suckling. Cup-drinking, Stage I. Spoon-feeding begins. Phasic bite reflex develops to munching.	Controls breath stream. Varies pitch. Vocalizes vowel sounds (nonimitative). Begins to babble (consonant sounds). Responds to name.	Laughs aloud. Responds to talking.
One hand approach to objects. Transfers objects. Thumb begins to move toward forefinger.	Protective extension forward in upper extremities begins (9-10 months). Phasic bite develops to munching.	Sucking. Cup-drinking, Stage I, continues. More refined spoon-feeding. Chewing.	Recognizes some familiar names. Plays peek-a-boo, pat-a-cake. Stops to "No." Gestures to some familiar words or requests (come, byebye, up). Babbles imitatively. Jargons.	Differentiates family members. Fearful of strangers.
Finer adjustment of digits; inferior-pincer grasp. Pokes with forefinger. Beginning of voluntary release and neat pincer grasp with slight extention of wrist (10-11 months).	Protective extension sidewards in upper extremities begins at 7 months. STNR disappears (8-12 months). Tilting responses in sitting begin at 7-8 months.	Sucking, cup-drinking (Stage I), spoon-feeding, and chewing continue.	Follows simple verbal requests (Put that down). Understands simple questions (Where?). Attends to speech. Gestures appropriately. First words (mama, dada, byebye). Jargons.	Plays peek-a-boo and pat-a-cake.
Opposition or thumb/forefinger grasp. Wrist extended and deviated to ulnar side for accurate prehension (12-14 months).		More refined cup-drinking (Stage II, Stage III). Chewing. Refined spoon-feeding by 2 years.	13–18 months: Rapid receptive growth. Slow expressive development. 18-24 months: The naming stage. Holophrases. Jargoning. Echolalia. Two-and three-word phrases.	Eats at table with family. More social and verbal. Negativism emerges.
Gradual progression of three jaw chuck position occurs.		By 3 years sucking through straw.	By 2 years, uses 40% sentences. Rapid syntactic development. Early-developing consonants emerge: m, n, p, b, t, d, k, g, w, f, h**.	Temper tantrums and refusal of food common. Toilet training in process if not already completed.
Minute degrees of flexion and extension of interphalangeal joints in three jaw chuck position.			Sentence length and complexity increase. Uses language for a variety of purposes (to satisfy needs, pretend, argue, etc.). Other consonants emerge: y, s, r, l, sh, j, ch, v**.	Moves from parallel to cooperative play. Able to conform.
Refinement of individual finger coordination i.e., piano playing. Ability to use one upper extremity for one task, one for a different task.			Receptive and expressive language develop in relation to cognitive growth.	Acceptable table manners. Peers becoming more important.
			Speech sounds are completely developed by 8-9 years.	Manageable, social and conforming.
			Receptive and expressive language continue to develop in complexity.	Secondary sex characteristics develop. Self image in question.
				Body changes influence body image. Independence/dependence conflict.
				Achieves social/sexual role. Peer pressure great.
				Desires and achieves socially responsive behavior.

NORMAL FEEDING DEVELOPMENT CHART

** - (Templin, 1957)

Appendix II.

Developmental Feeding Tool

The Developmental Feeding Tool (DFT) has two specific purposes.

1) As a screening tool to be used by primary health care staff to identify children with feeding problems.

2) As an indepth assessment tool to be used by members of a feeding team individually or as a group in the evaluation of a child with feeding problems. It can be used alone or with the Normal Feeding Development Chart (pp. 74). It was designed for easy data tabulation either by hand or computer.

The tool increases efficiency in data collection and reporting. Designed by the interdisciplinary staff of the University of Tennessee Child Development Center to illustrate the broad scope of feeding, the tool is useful in didactic and clinical instruction as well as in diagnostic evaluations. Although it has not yet been validated, the Developmental Feeding Tool has been used successfully in a clinical setting by both clinicians and trainees for the past year and a half. Any member of the feeding team is able to use it as a screening tool to identify gross problems and make appropriate referrals. For indepth assessment, very specific expertise in particular areas is necessary to diagnose many of the problems included. Regular use should broaden the perspective of health professionals in respect to the complexity of feeding and the feeding process.

DEVELOPMENTAL FEEDING TOOL (DFT)

Date ____________________
Staff member ____________________
Parent/Guardian ____________________
Address ____________________
City ____________________ State __________ Zip __________
County ____________________ Telephone ______ __________
Referrer ____________________
Child's name ____________________
Birth date __________ Age ______ Sex __________ Race __________
Head circumference (cm)________ (%ile NCHS)________ Hand dominance__________
Height (cm)______ (%ile NCHS)______ Weight (kg)______ (%ile NCHS)__________
Weight for height (%ile NCHS)______ Hematocrit______ Urine screen__________

PHYSICAL

Yes No

Size

____ ____ 1. Weight (Avg. %ile NCHS)
____ ____ 2. Underweight
____ ____ 3. Overweight
____ ____ 4. Stature (Avg. %ile NCHS)
____ ____ 5. Short (below 5th %ile for ht. NCHS)
____ ____ 6. Tall (above 95th %ile for ht. NCHS)
____ ____ 7. Abnormal body proportions*
____ ____ 8. Head circumference (Avg. %ile NCHS)
____ ____ 9. Microcephalic
____ ____ 10. Macrocephalic

Laboratory

____ ____ 11. Hematocrit (Normal)
____ ____ 12. Urine screen (Normal)*

Health Status

____ ____ 13. Bowel problems*
____ ____ 14. Diabetes
____ ____ 15. Vomiting
____ ____ 16. Dental caries
____ ____ 17. Anemia
____ ____ 18. Food allergies/intolerance*
____ ____ 19. Medications*
____ ____ 20. Vitamin/mineral supplements *
____ ____ 21. Ingests non-food items
____ ____ 22. Therapeutic diet*
____ ____ 23. General Appearance (Normal)*
____ ____ 24. Head (Normal)*
____ ____ 25. Eyes (Normal)*
____ ____ 26. Ears (Normal)*
____ ____ 27. Nose (Normal)*
____ ____ 28. Teeth/gums (Normal)*
____ ____ 29. Palate (Normal)*
____ ____ 30. Skin (Normal)*
____ ____ 31. Muscles (Normal)*
____ ____ 32. Arms/hands (Normal)*
____ ____ 33. Legs/feet (Normal)*

NEUROMOTOR/MUSCULAR

Yes No

Tonicity

____ ____ 34. Body tone (Normal)*

Head and Trunk Control

____ ____ 35. Head control (Normal)*
____ ____ 36. Lifts head in prone
____ ____ 37. Head lags when pulled to sitting
____ ____ 38. Head drops forward
____ ____ 39. Head drops backward
____ ____ 40. Trunk control (Normal)*

Upper Extremity Control

____ ____ 41. Range of motion (Normal)*
____ ____ 42. Approach to object (Normal)*
____ ____ 43. Grasp of object (Normal)*
____ ____ 44. Release of object (Normal)*
____ ____ 45. Brings hand to mouth
____ ____ 46. Dominance established

Reflexes

____ ____ 47. Grossly normal
____ ____ 48. Asymmetrical tonic neck reflex*
____ ____ 49. Symmetrical tonic neck reflex*
____ ____ 50. Moro reflex*
____ ____ 51. Grasp reflex*

Body Alignment

____ ____ 52. Scoliosis
____ ____ 53. Kyphosis
____ ____ 54. Lordosis
____ ____ 55. Hip subluxation or dislocation, suspected

Position in Feeding

____ ____ 56. Mother's lap
____ ____ 57. Infant seat
____ ____ 58. High chair
____ ____ 59. Table and chair
____ ____ 60. Wheelchair
____ ____ 61. Other adaptive chair*

ORAL/MOTOR

Yes No

Facial Expression

____ ____ 62. Symmetrical structure/function*
____ ____ 63. Muscle tone lips/cheeks (Normal)
____ ____ 64. Hypertonic muscle tone of lips
____ ____ 65. Hypotonic muscle tone of lips

Oral Reflexes

____ ____ 66. Gag (Normal)*
____ ____ 67. Bite (Normal)*
____ ____ 68. Rooting (Normal)*
____ ____ 69. Suck/swallow (Normal)*

Respiration

____ ____ 70. Mouth
____ ____ 71. Nose
____ ____ 72. Thoracic
____ ____ 73. Abdominal
____ ____ 74. Regular rhythm*

Oral Sensitivity

____ ____ 75. Inside mouth (Normal)*
____ ____ 76. Outside mouth (Normal)*
____ ____ 77. Hypersensitivity*
____ ____ 78. Hyposensitivity*
____ ____ 79. Intolerance to brushing teeth

FEEDING PATTERNS

Bottle-feeding

____ ____ 80. Suckling tongue movements
____ ____ 81. Sucking tongue movements
____ ____ 82. Firm lip seal*
____ ____ 83. Coordinated suck-swallow-breathing
____ ____ 84. Difficulty swallowing*

Cup-drinking

____ ____ 85. Adequate lip closure*
____ ____ 86. Loses less than ½ total amount*
____ ____ 87. Wide up-and-down jaw movements
____ ____ 88. Stabilizes jaw by biting edge of cup
____ ____ 89. Stabilizes jaw through muscle control

* - List or specify on COMMENTS Section

Yes No

___ ___ 90. Drinks through a straw

Feeding patterns - Spoon feeding

___ ___ 91. Suckles as food approaches
___ ___ 92. Cleans food off lower lip
___ ___ 93. Cleans food off spoon with upper lip

Feeding Patterns - Chewing

___ ___ 94. Munching pattern

Lateralizes tongue:

___ ___ 95. When food placed between molars
___ ___ 96. When food placed center of tongue
___ ___ 97. To move food from side to side
___ ___ 98. Vertical jaw movements
___ ___ 99. Rotary jaw movements
___ ___ 100. Lip closure during chewing*

Isolated, Voluntary Tongue Movements

___ ___ 101. Protrudes/retracts tongue
___ ___ 102. Elevates tongue outside mouth
___ ___ 103. Elevates tongue inside mouth
___ ___ 104. Depresses tongue outside mouth
___ ___ 105. Depresses tongue inside mouth
___ ___ 106. Lateralizes tongue outside mouth
___ ___ 107. Lateralizes tongue inside mouth

Special Oral Problems

___ ___ 108. Drools*
___ ___ 109. Thrusts tongue when utensil placed in mouth*
___ ___ 110. Thrusts tongue during chewing/swallowing*
___ ___ 111. Other oral-motor problem*

NUTRITION HISTORY

Past Status

___ ___ 112. Feeding problems birth - 1 year*
___ ___ 113. Breast fed
___ ___ 114. Bottle fed
___ ___ 115. Weaned

Current Status

___ ___ 116. Eats blended food
___ ___ 117. Eats limited texture
___ ___ 118. Eats chopped table foods
___ ___ 119. Eats table foods
___ ___ 120. Feeds unassisted

Yes No

___ ___ 121. Feeds with partial guidance
___ ___ 122. Feeds with complete guidance
___ ___ 123. Drinks from a cup unassisted
___ ___ 124. Drinks from a cup assisted
___ ___ 125. Finger-feeds
___ ___ 126. Uses a spoon
___ ___ 127. Uses a fork
___ ___ 128. Uses a knife
___ ___ 129. Average rate of eating
___ ___ 130. Fast rate of eating
___ ___ 131. Slow rate of eating

Diet Review

___ ___ 132. Appetite normal
___ ___ 133. Eats 3 meals/day
___ ___ 134. Snacks daily

Dietary Intake, Current

___ ___ 135. Milk/dairy products, 3-4/day
___ ___ 136. Vegetables, 2-3/day
___ ___ 137. Fruit, 2-3/day
___ ___ 138. Meat/meat substitute, 2-3/day
___ ___ 139. Bread/cereal, 3-4/day
___ ___ 140. Sweets/snacks, 1-2/day
___ ___ 141. Liquids, 2 cups/day

SOCIAL/BEHAVIORAL

Child-Caregiver Relationship

___ ___ 142. Child responds to caregiver
___ ___ 143. Caregiver affectionate to child

Social Skills

___ ___ 144. Eye contact
___ ___ 145. Smiles
___ ___ 146. Gestures, i.e. waves byebye
___ ___ 147. Clings to caregiver
___ ___ 148. Interacts with examiner
___ ___ 149. Responds to simple directions
___ ___ 150. Seeks approval
___ ___ 151. Toilet trained
___ ___ 152. Knows own sex

Behavior Problems

___ ___ 153. Self abusive
___ ___ 154. Hyperactive
___ ___ 155. Aggressive

Yes No

___ ___ 156. Withdrawn
___ ___ 157. Other*

Play

___ ___ 158. Plays infant games, i.e. pat-a-cake
___ ___ 159. Solitary play
___ ___ 160. Parallel play
___ ___ 161. Cooperative play
___ ___ 162. Additional comments*

Number **COMMENTS**

FOODS FOR EVERYDAY – TYPES AND AMOUNTS

Appendix III.

	1 -3 years	4 - 6 years	7 - 10 years	11 - 19 years	
MEAT Group					
Meat, poultry, fish, eggs. dried beans and peas, peanut butter, nuts, and seeds	2 servings (1oz. each)	2 servings (1½ oz. each)	2 servings (1½-2 oz. each)	2 servings (2-3 oz. each)	Substitutes for the protein of 1 oz. meat: 1 egg, 1 oz. cheese, ¼ c. cottage cheese, ¼ c. peanuts, 1/3 c. other nuts, ½ c. A cooked dry peas or beans, 2 T. peanut butter.
MILK Group					
Milk (whole, skim, dry, evaporated, buttermilk) and other dairy products	20 oz.	20-24 oz.	3 cups	3-4 cups (5-6 cups for pregnant teens)	Substitutes for the calcium of 1 cup milk: 1 c. yogurt, 1 1/3 c. cottage cheese, 1½ c. ice cream, 1¼ oz. (1/3 c. grated) natural cheese, 1 3/4 oz. process cheese.
VEGETABLE - FRUIT Group					
For Vit. A: deep yellow-orange or very dark green vegetables and fruits. For Vit. C: citrus fruit, melon, strawberries, broccoli, tomatoes, raw cabbage	4 servings or more (3 T. each)	4 servings or more (¼ c. each)	4 servings or more (1/3 c. each)	4 servings or more (½ c. each)	Eat one vitamin C source daily, one high vitamin A source at least every other day. Other fruits and vegetables fill out this food group.
BREAD - CEREAL Group					
Whole grain or enriched bread, cereal, rice, pasta	3 servings ½ sl. bread ¼ c. cereal	4 servings ½ sl. bread 1/3 c. cereal	4 servings or more 1 sl. bread 3/4 c. cereal	4 servings or more (6 or more for teenage boys) 1 sl. bread 1 c. cereal	Very active children, teens, adults and athletes need more for energy.
FATS - SWEETS - ALCOHOL Group	Use with caution. These foods provide kilocalories but few nutrients				
Calorie needs	1,300	1,800	2,400	2,400 girls 2,800-3,000 boys	

Adapted from: Meal Time Happy Time, A Guide for Parents, The American Dietetic Association, 430 North Michigan Avenue, Chicago, IL., 60611
The Hassle Free Daily Food Guide, USDA, Washington, D.C. 20402

SELECTED COMMERCIAL DIETARY SUPPLEMENTS

Appendix IV.

Product	Major Components	Features
Compleat - B (Doyle Pharmaceutical Co.)	Orange juice, corn oil, nonfat dry milk, sucrose, peaches, peas, green beans, maltodextrin, pureed beef, vitamins, and minerals	Blenderized formula for tube feeding. Ready to serve. Presterilized
Dextro-Maltase (Mead Johnson and Co.)	Corn starch hydrolysate	Calorie supplement for infant feeding
Ensure (Ross Laboratories)	Soy protein isolate, casein, corn oil, corn syrup solids, sucrose, vitamins, and minerals	Dietary supplement, for tube or oral feeding. Lactose free and high in iodine
Ensure Plus (Ross Laboratories)	Soy protein isolate, casein, corn oil, corn syrup solids, sucrose, vitamins, and minerals	Higher level of protein and calories than Ensure Tube or oral dietary supplement. Ready to serve 1.8 Kcal/ml.
Formula 2 (Cutter Laboratories, Inc.)	Strained vegetables, fruits, cereals, corn oil, beef, egg yolk, nonfat dry milk, vitamins, and minerals	Blenderized formula for tube feeding. Ready to serve. Presterilized
Isocal (Mead Johnson and Co.)	MCT, soy oil, corn syrup. sucrose, essential amino acids, casein hydrolysate	Elemental, low residue formula for tube or oral feeding. Ready to serve, presterilized. Lactose free
Meritene (Doyle Pharmaceutical Co.)	Concentrated sweet milk, corn syrup solids, vegetable oil, sodium caseinate, sucrose, natural and artificial flavoring, salt, stabilizers, vitamins, and minerals	Oral or tube feeding
Polycose (Ross Laboratories)	Glucose polymers derived from controlled hydrolysis of corn starch	Mixes easily with other foods to provide additional calories
Sustacal - Sustagen Powder Susta Pudding (Mead Johnson and Co.)	Sodium caseinate, soy oil, skim milk, corn syrup, sugar, vitamins and minerals	Variety of forms available to meet individual patient's needs. Can be fed by tube or orally
Vivonex (Eaton Laboratories)	Amino acids, safflower oil, glucose, glucose oligosaccharides	Semisynthetic fiber free liquid oral or tube feeding
Vivonex HN (Eaton Laboratories)	Amino acids, safflower oil, glucose, glucose oligosaccharides	High nitrogen, low residue, semisynthetic fiber free liquid oral or tube feeding

EFFECTS OF DRUGS ON NUTRITIONAL STATUS

Appendix V.

Drugs	Effects
Amphetamines and Other Psychomotor Stimulants Amphetamine Sulfate [Benzedrine] Dextroamphetamine Sulfate [Dexedrine] Methamphetamine Hydrochloride [Desoxyn, Syndrox] Methylphenidate Hydrochloride [Ritalin] Oxazolidinediones Trimethadione [Tridone] Miscellaneous Carbamazepine [Tegretol] Diazepam [Valium] Primidone [Mysoline] Valproic Acid	Cause anorexia, nausea, abdominal pain; may produce hypertension or hypotension; cause weight loss or growth delay; alter taste sensitivity; cause weight gain in hyperactive children.
Analgesics and Antipyretics Alcohol Narcotic Derivatives Para-aminophenol Derivatives Salicylates	Alter absorption of B_{12}, folate, amino acids; affect metabolism of zinc and magnesium; cause nausea, gastrointestinal discomfort, vomiting, anorexia, and constipation; decrease absorption of tryptophan, possibly other amino acids, and glucose; antagonize vitamin K.
Antidepressants Imipramine Hydrochloride [Tofranil] Amitriptyline Hydrochloride [Elavil]	Cause nausea, epigastric distress, vomiting, anorexia, stomatitis, diarrhea or constipation, swelling of parotid glands, black tongue, peculiar taste, dry mouth, and weight gain or loss.
Antianxiety Agents Chlordiazepoxide Hydrochloride [Librium] Clorazepate Dipotassium [Tranxene] Diazepam [Valium] Hydroxyzine [Visteral]	Cause nausea and constipation.
Anticonvulsants Barbiturates Phenobarbital Mephobarbital [Mebaral] Metharbital [Gemonil] Hydantoins Diphenylhydantoin [Dilantin] Ethotoin [Peganone] Succinimides Ethosuximide [Zarontin] Methsuximide [Celontin] Phensuximide [Milontin]	Cause folate deficiency that leads to megloblastic anemia; derange vitamin D metabolism to produce rickets (biochemical and roentgenographic); decrease serum levels of folate, B_{12}, pyridoxine, 25-hydroxycholecalciferol, calcium, and magnesium; cause nausea, vomiting, anorexia, weight loss, epigastric and abdominal pain, and constipation.
Antipsychotic Agents Chlorpromazine [Thorazine] Haloperidol [Haldol] Prochlorperazine Maleate [Compazine Maleate] Trifluoperazine Hydrochloride [Stelazine] Thioridazine [Mellaril] Thiothixene [Navene]	Cause constipation, weight gain, anorexia, nausea, vomiting, and dyspepsia; may increase appetite in some cases; possibly cause increased serum cholesterol, anemia, edema, and decreased salivation.
Other Psychotherapeutic Agent Lithium Carbonate [Eskalith, Lithane, Lithonate]	Must be carefully monitored; has unpleasant, persistent metallic taste; causes anorexia, diarrhea, nausea, and aplastic anemia; increases plasma magnesium and calcium excretion; decreases calcium uptake from bone.
Sedatives and Hypnotics Chloral Hydrate Phenobarbital Mephobarbital [Mebaral] Pentobarbital [Nembutal] Promethazine Hydrochloride [Phenergan]	Cause gastrointestinal disturbances such as nausea and vomiting; may cause megaloblastic anemia; may derange vitamin D metabolism to produce rickets, (biochemical and roentgenographic); decrease serum levels of folate, B_{12}, pyridoxine, 25-hydroxycholecalciferol, calcium, and magnesium; decrease absorption of thiamine; increase urinary ascorbic acid.

References:

AMA Department of Drugs. 1973. *AMA Drug Evaluations,* Second Edition. Action, Massachusetts: Publishing Sciences Group, Inc.

March, D.C. 1978. *Handbook: Interactions of Selected Drugs with Nutritional Status in Man,* Second Edition. Chicago: The American Dietetic Association.

Moore, A.O. and D.E. Powers. 1979. *Food-Medication Interactions.* Paradise Valley, Arizona: Quail Run Publications, Inc.

RESOURCES FOR INFORMATION ON REFERRAL REGARDING FEEDING OR OTHER PROBLEMS OF THE HANDICAPPED

Appendix VI.

I. University Affiliated Centers with Nutritional Components

Alabama
Center for Developmental and Learning Disorders
University of Alabama at Birmingham
1919 7th Avenue, S.
Birmingham, Alabama 35206

California
University Affiliated Training Program
Children's Hospital of Los Angeles
University of Southern California
4650 Sunset Blvd.
Los Angeles, California 90007

Colorado
John F. Kennedy Child Development Center
University of Colorado Medical Center
4200 E. 9th Avenue
Denver, Colorado 80220

District of Columbia
Georgetown University Hospital
University Affiliated Facility
3800 Reservoir Road, N.W.
Washington, D. C. 20009

Florida
Mailman Center for Child Development
P. O. Box 016820
1601 N.W. 12th Avenue
University of Miami
Miami, Florida 33152

Georgia
Georgia Retardation Center
850 College Station Road
Athens, Georgia 30605

Indiana
Riley Child Development Center
Indiana University School of Medicine
1100 West Michigan Street
Indianapolis, Indiana 46202

Iowa
University Hospital School
The University of Iowa
Iowa City, Iowa 52242

Kansas
Children's Rehabilitation Unit
University of Kansas Medical Center
39th and Rainbow Boulevard
Kansas City, Kansas 66103

Maryland
J. F. Kennedy Institute for Handicapped Children
Johns Hopkins University
707 North Broadway-Monument Street
Baltimore, Maryland 21205

Massachusetts
University Affiliated Center
Walter E. Fernald State School
Trapelo Road
Waltham, Massachusetts 02254

Children's Hospital Mental Retardation Center
300 Longwood Avenue
Boston, Massachusetts 02115

New York
Mental Retardation Institute
Westchester County Medical Center
Valhalla, New York 10595

Rose F. Kennedy Center
Albert Einsten College of Medicine
Yeshiva University
1410 Pelham Parkway S.
Bronx, New York 10461

North Carolina
Division for Disorders of Development and Learning
University of North Carolina
Biological Sciences Research
Center 220H
Chapel Hill, North Carolina 27514

Ohio
University Affiliated Center for Developmental Disorders
University of Cincinnati
Elland and Bethesda Avenues
Cincinnati, Ohio 45229

Nisonger Center
The Ohio State University
1580 Cannon Drive
Columbus, Ohio 43210

Oregon
Child Development and Rehabilitation Center
Crippled Children's Division
University of Oregon Health Sciences Center
P. O. Box 574
Portland, Oregon 97207

Tennessee
Child Development Center
University of Tennessee
711 Jefferson Avenue
Memphis, Tennessee 38105

Texas
University Affiliated Center for Developmentally Disabled Children
Southwestern Medical School
University of Texas Health Sciences Center at Dallas
5323 Harry Hines Boulevard
Dallas, Texas 75235

Washington
Clinical Training Unit WJ10
Child Development Mental Retardation Center
University of Washington
Seattle, Washington 98195

Wisconsin
Waisman Center
University of Wisconsin
1500 Highland Avenue
Madison, Wisconsin 53706

II. Selected State Agencies

Public Health Department
  Maternal and Child Health
  Crippled Children's Services
Mental Health/Mental Retardation Department
  Residential Facilities
  Community Facilities
  Developmental Evaluation Centers
Education Department
  Special Education Program
  Early Childhood Programs

III. Selected Federal Agencies

Administration on Developmental Disabilities
U. S. Department of Health and Human Services
330 Independence Avenue
Washington, D. C. 20201

Maternal and Child Health
Bureau of Community Health Services
Office of Health Services Administration
Parklawn Building
5600 Fishers Lane
Rockville, Maryland 20857

National Institute of Child Health and Human Development
Center for Research for Mothers and Children
Landau Building
National Institute of Health
Bethesda, Maryland 20205

IV. Professional Organizations

American Association on Mental Deficiency
5101 Wisconsin Avenue
Washington, D. C. 20016

American Association of University Affiliated Programs
1234 Massachusetts Avenue, N.W.
Suite 813
Washington, D.C. 20005

The American Dietetic Association
430 North Michigan Avenue
Chicago, Illinois 60611

The American Occupational Therapy Association, Inc.
1383 Piccard Drive, Suite 300
Rockville, Maryland 20850

The American Physical Therapy Association
1156 15th Street, N. W.
Washington, D. C. 20005

The American Speech-Language-Hearing Association
10801 Rockville Pike
Rockville, Maryland 20852

Council for Exceptional Children
1920 Association Drive
Reston, Virginia 22901

V. Service Organizations

Association for Retarded Citizens of the United States
Avenue J
Arlington, Texas 76011

American Foundation for the Blind, Inc.
15 West 16th Street
New York, New York 10011

Information Center for Individuals with Disabilities
20 Providence Street, Room 329
Boston, Massachusetts 02116

March of Dimes Birth Defects Foundation
1275 Mamaroneck Avenue
White Plains, New York 10605

Muscular Dystrophy Association
810 Seventh Avenue
New York, New York 10019

National Easter Seal Society
2023 West Ogden Avenue
Chicago, Illinois 60612

Sister Kenny Institute
Occupational Therapy Department
800 East 28 Street at Chicago Avenue
Minneapolis, Minnesota 55407

United Cerebral Palsy Associations, Inc.
66 East 34th Street
New York, New York 10016

RESOURCE LISTS

I. Special Equipment for Feeding the Handicapped

AAMED, Inc.
1215 So. Harlem Avenue
Forest Park, Illinois 60130

J. A. Preston Corporation
71 Fifth Avenue
New York, New York 10005

Fairway King, Inc.
4408 No. Sewell
Oklahoma City, Oklahoma 73118

G. E. Miller, Inc.
484 So. Broadway
Yonkers, New York 10705

Cleo Living Aids
3957 Mayfield Road
Cleveland, Ohio 44121

Fred Sammons, Inc.
Be OK Self-Help Aids Catalog
Box 32
Brookfield, Illinois 60513

II. Screening Tools

DDST	Denver Developmental Screening Test LADOCA Project and Publishing Foundation, Inc. East 51st Avenue & Lincoln Street Denver, Colorado 80216
HOME	Home Observation for Measurement of the Environment Center for Early Development and Education University of Arkansas 814 Sherman Street Little Rock, Arkansas 72202
Family Coping Index	c/o Ms. Kathryn Christian Instructive Visiting Nurse Association 223 South Cherry Street Richmond, Virginia 23220
EDPA	Erhardt Developmental Prehension Assessment 2109 3rd Street, North Fargo, North Dakota 58102